2D ANIMATION

MIT

Massachusetts Institute of Technology

Media Laboratory

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Introduction to Image Paths Generatives.

Preface

Animation is a method in which figures are manipulated to appear as moving images. In traditional animation, images are drawn or painted by hand on transparent celluloid sheets to be photographed and exhibited on film. Today, most animations are made with computer-generated imagery.

Source: wikipedia.org

Animation is the art of bringing life to an otherwise inanimate objects or illustrated 3D or 2D generated characters.

COMPUTER ANIMATION

CHARACTER ANIMATION

SHORT FILM

FILM ANIMATION

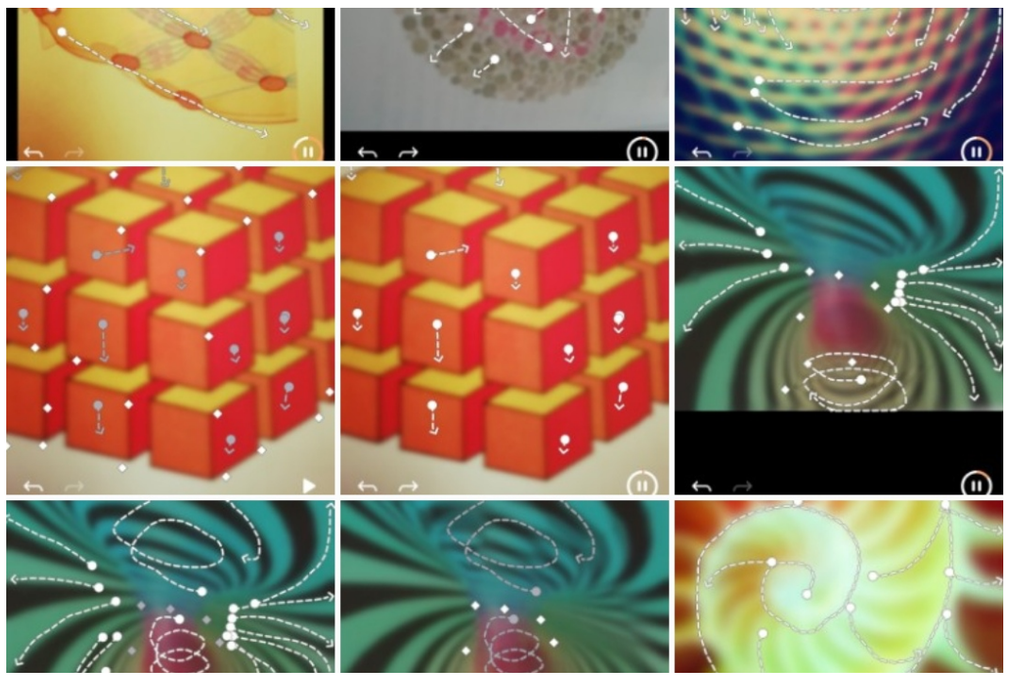
MOTION PICTURE

1. Path is a way or track laid down for walking or made by continual treading.
2. It is the course or direction in which a person or thing is moving.
3. It is a course of action or way of achieving a specified result.

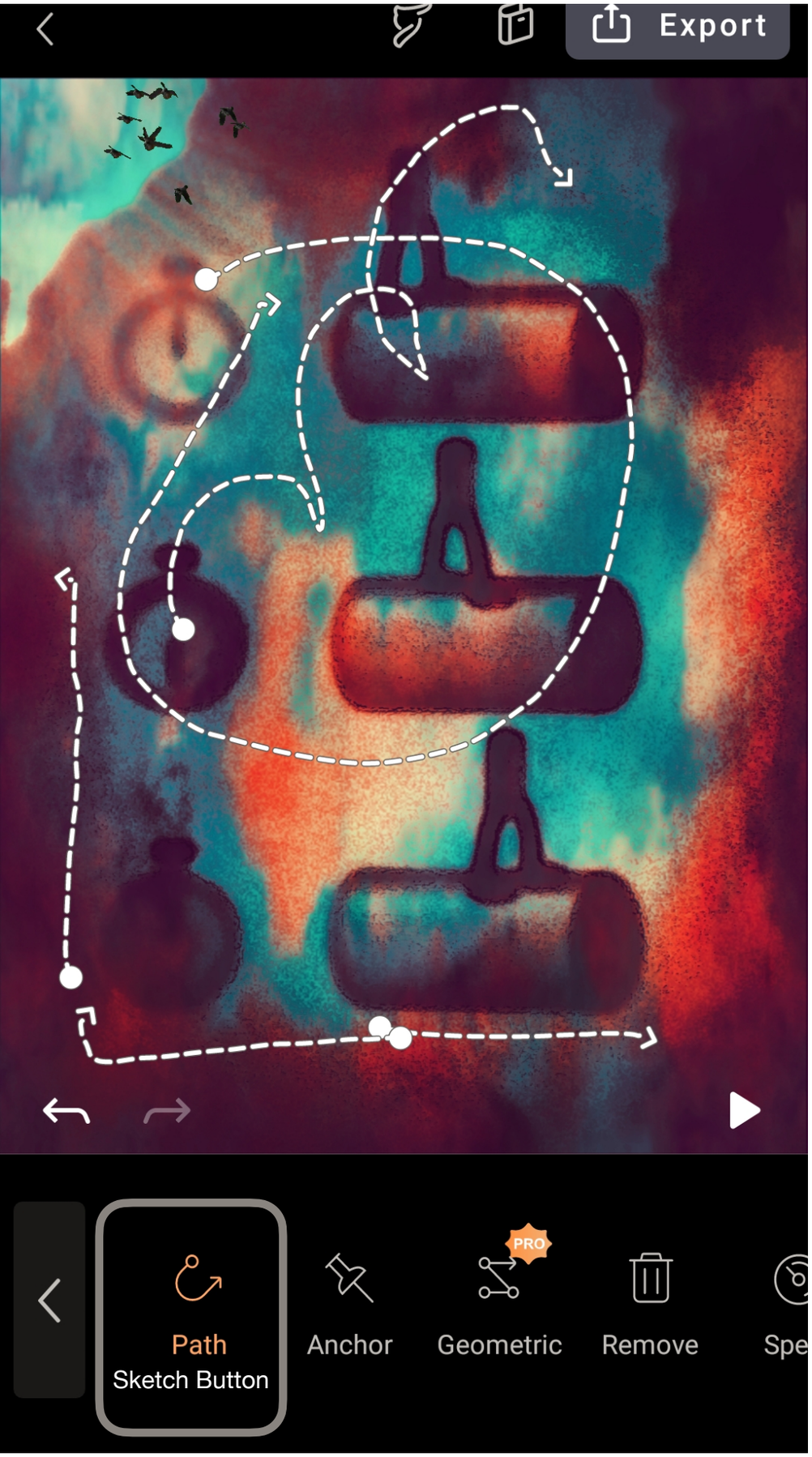
Path Animation is the process of animating one or more objects moving along a defined two-dimensional path through the imagery scene. The path is also motion path. This is about creating animated path with a single image for the purpose of making video outputs. This is done with a commercial tool MotionLeap Pro on Android Mobile phone.

(c) TradeMark Motionleap by Lightricks

Similar words:
Trail
Or
Trial.



Introduction

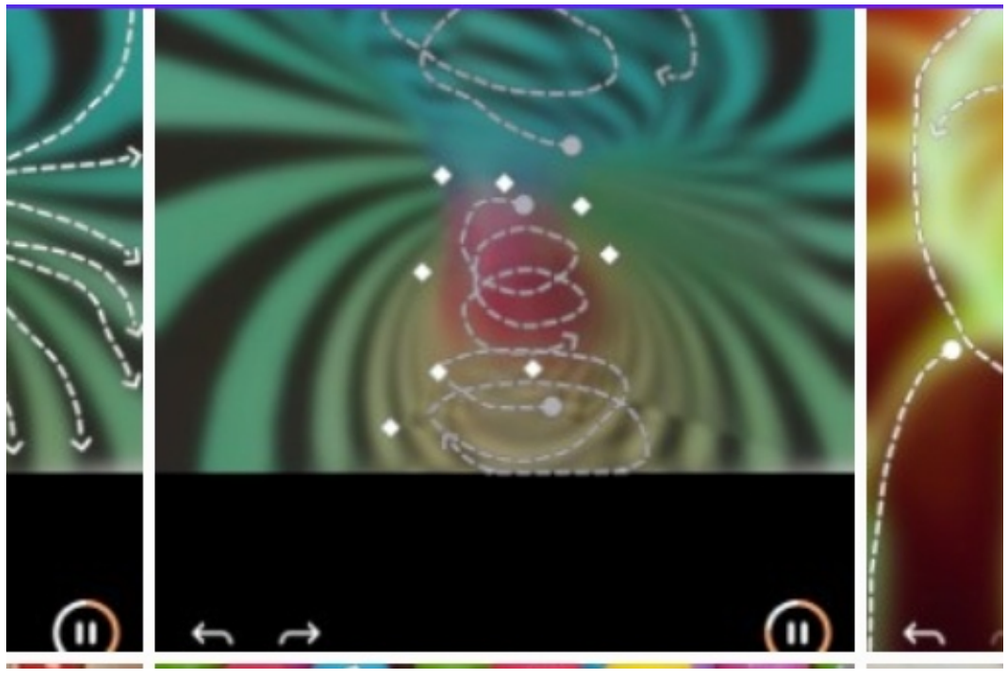


There are five curve paths in this image only.

A curve has a dot start point and an arrow end point.

Curve Paths in Making Video.

General path is a curve made with several paths to create regions for animation of pixels.



Chapter 1:

Grid Views of Image Paths.

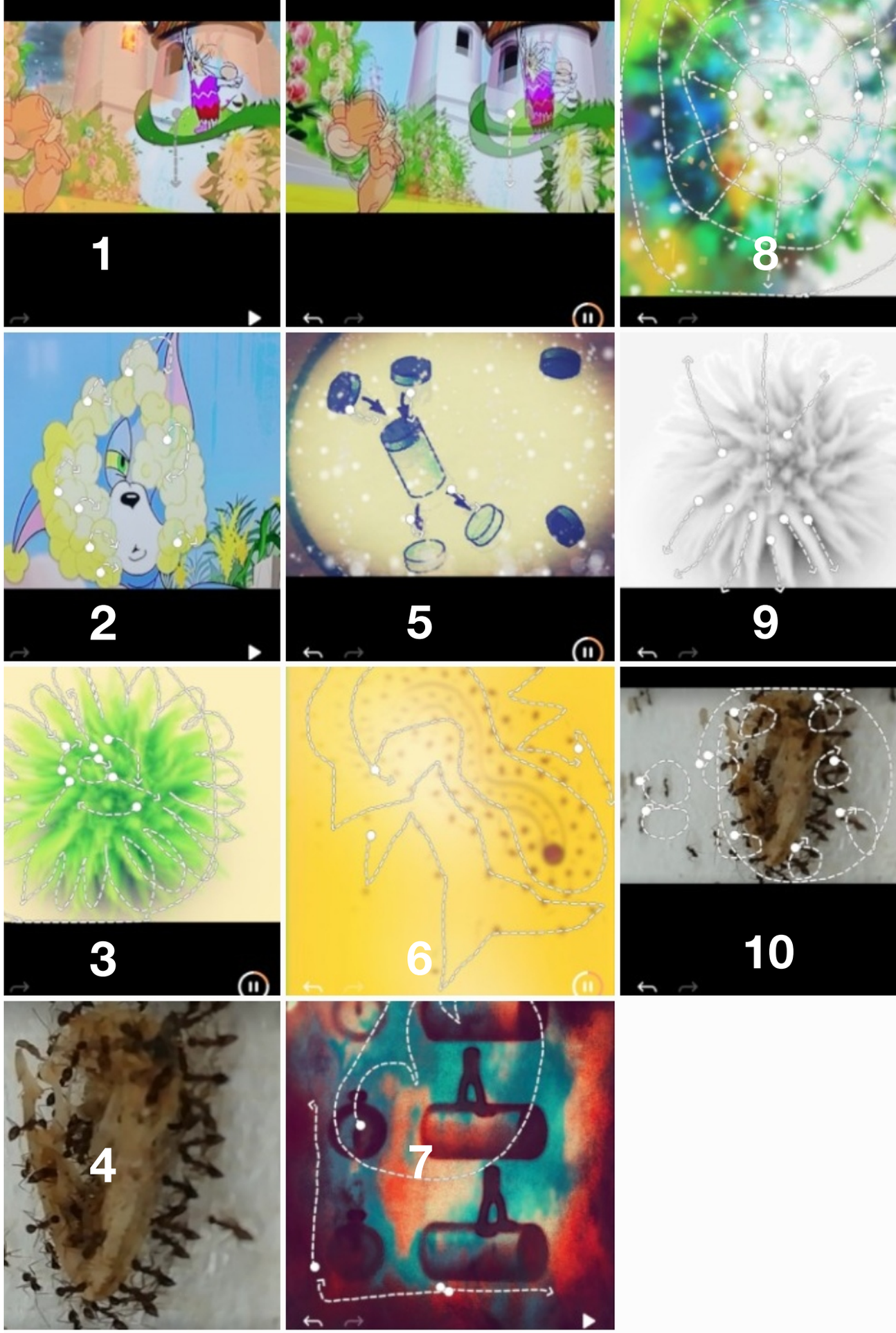
Grid View of 10 Image Paths.

1. This is a classic Tom and Jerry cartoon movie. Image was captured with a camera on TV during preview.

2. This image Jerry has a foamy face. Dotted paths are made on the face area.

3. This is an image of a virus. It's path is along the edges of the viral shape with some inner dotted paths.

4. This image is biologically inspired and it is made from a camera capture.



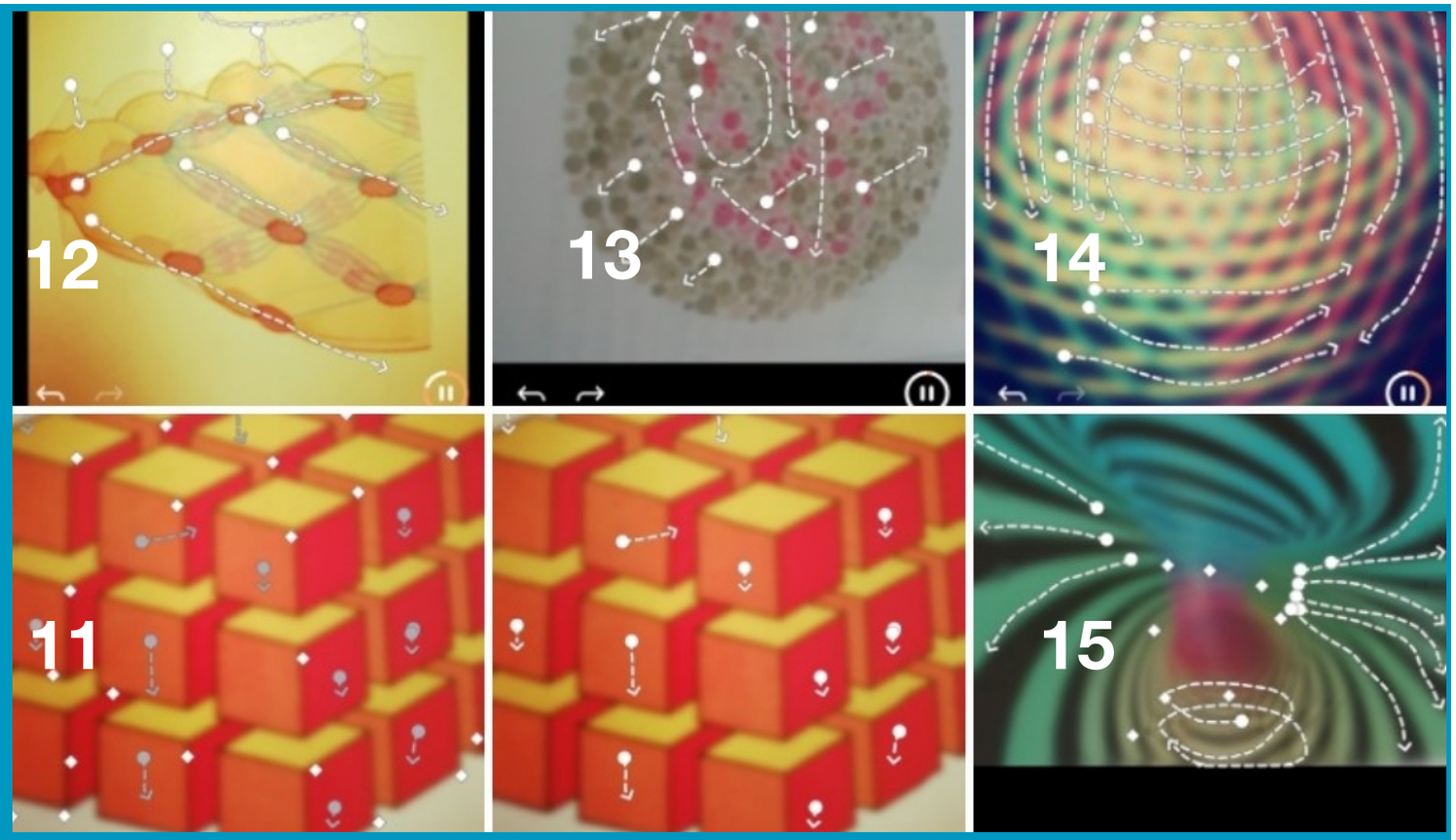
A. Image path 11 has many cubes or boxes arranged on top of the other with small off-distance.

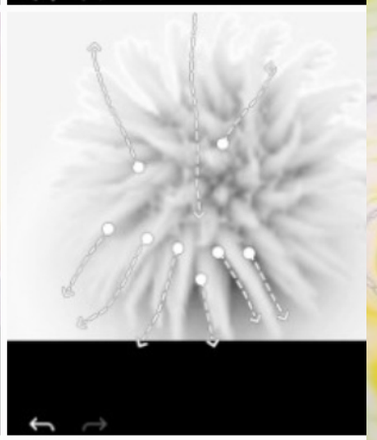
B. Image path 12 is also a biologically inspired.

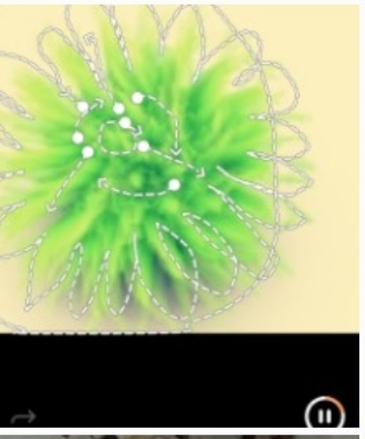
C. Image path 13 is a dotted circular shape of about more than three colours mainly pink, dark green and other colours.

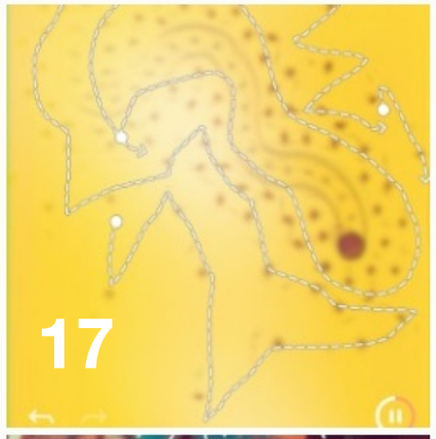
D. Here, Image path 14 is alike a spinning globe of many horizontal spins and verticals spins.

E. On Image path 15,Top Conical spins separated with a pink cone to another Many conical spins at the bottom.





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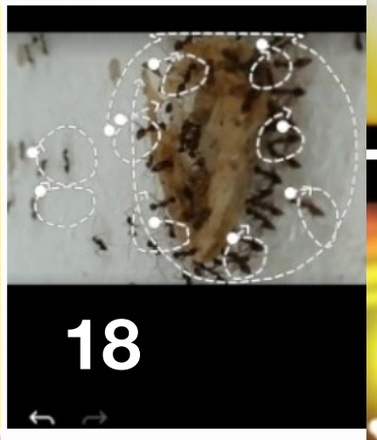
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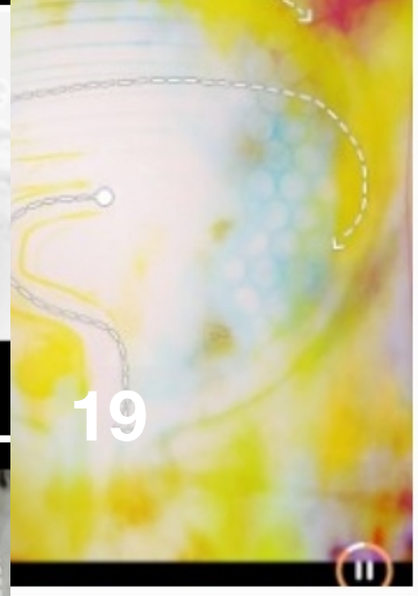
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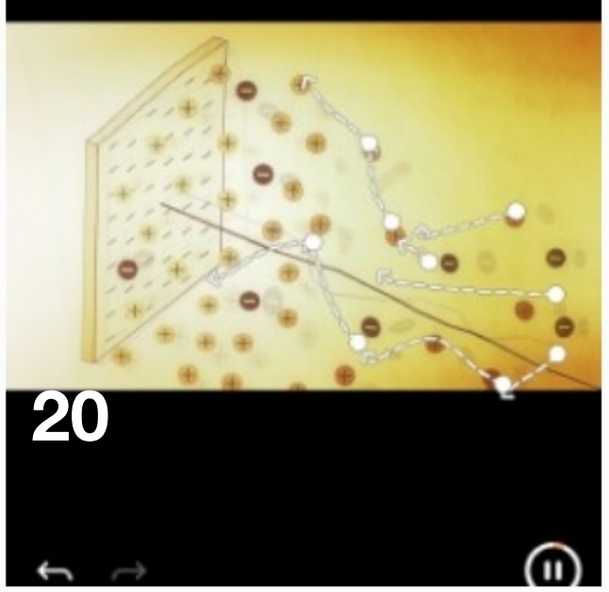
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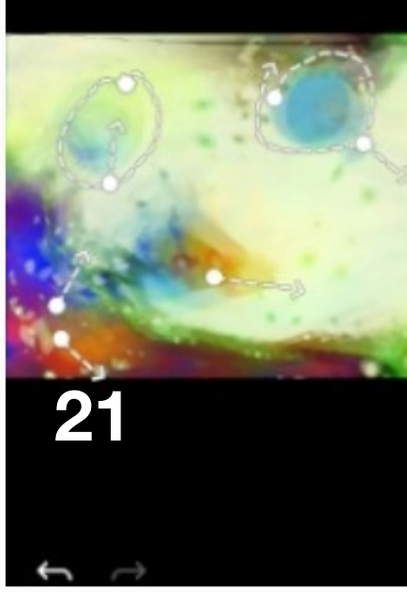
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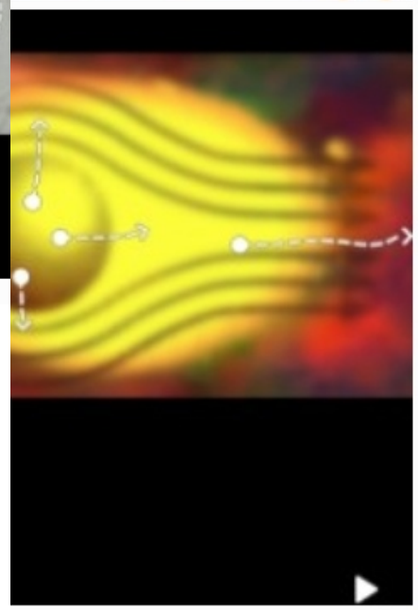

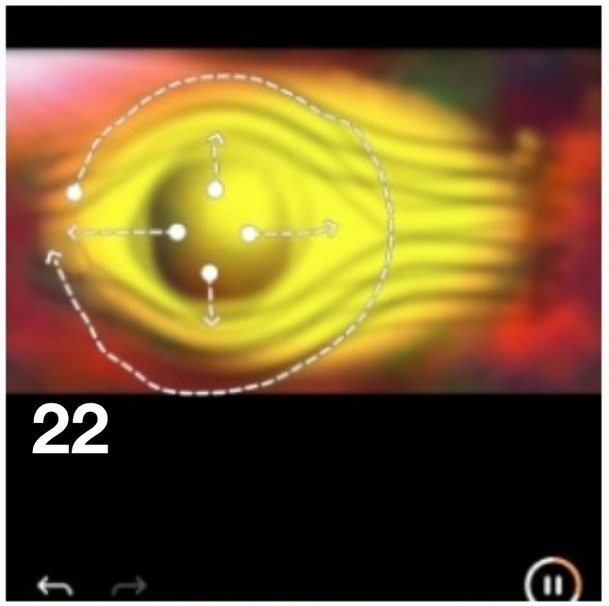
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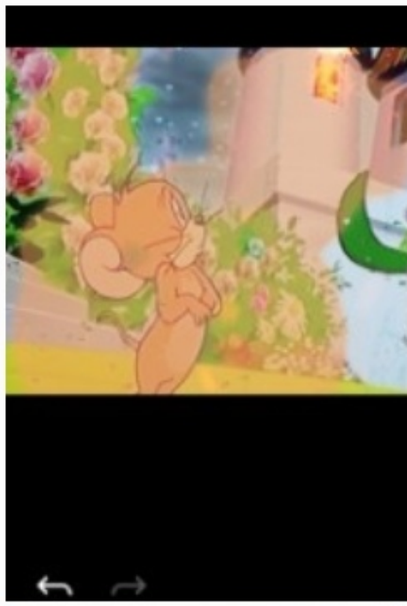
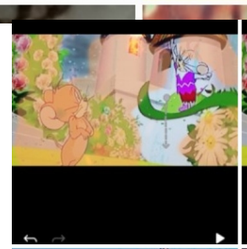
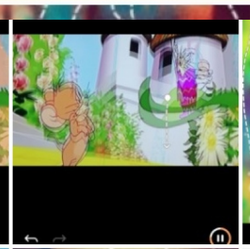
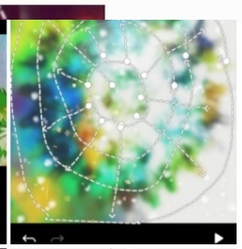
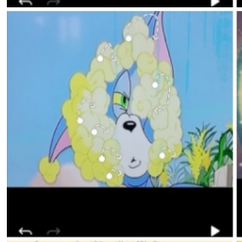
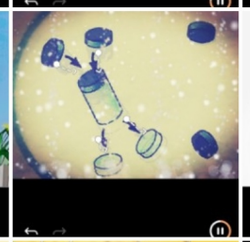


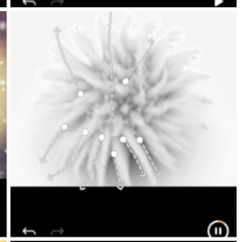


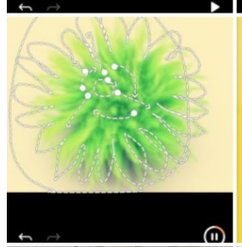


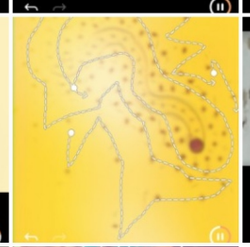


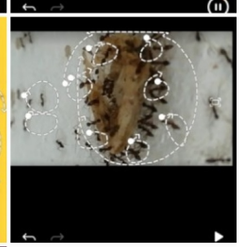


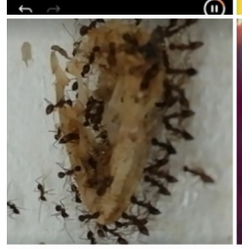


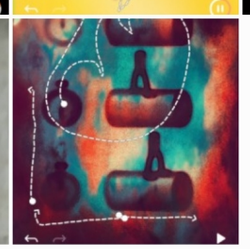


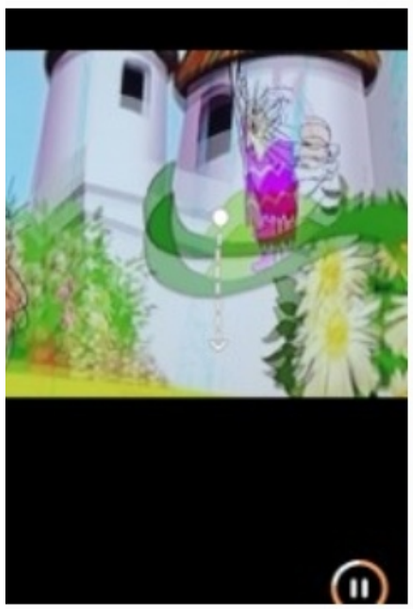






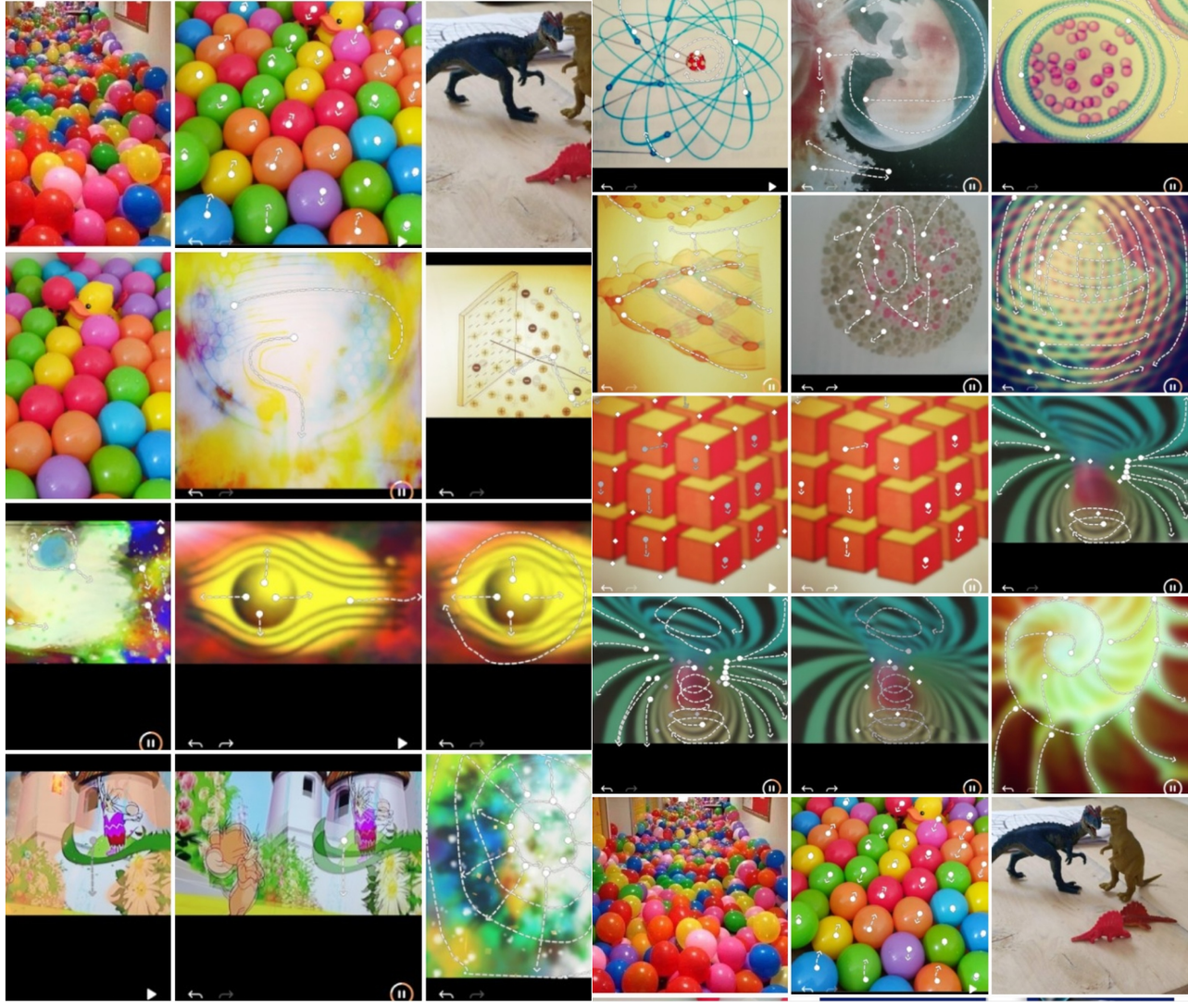


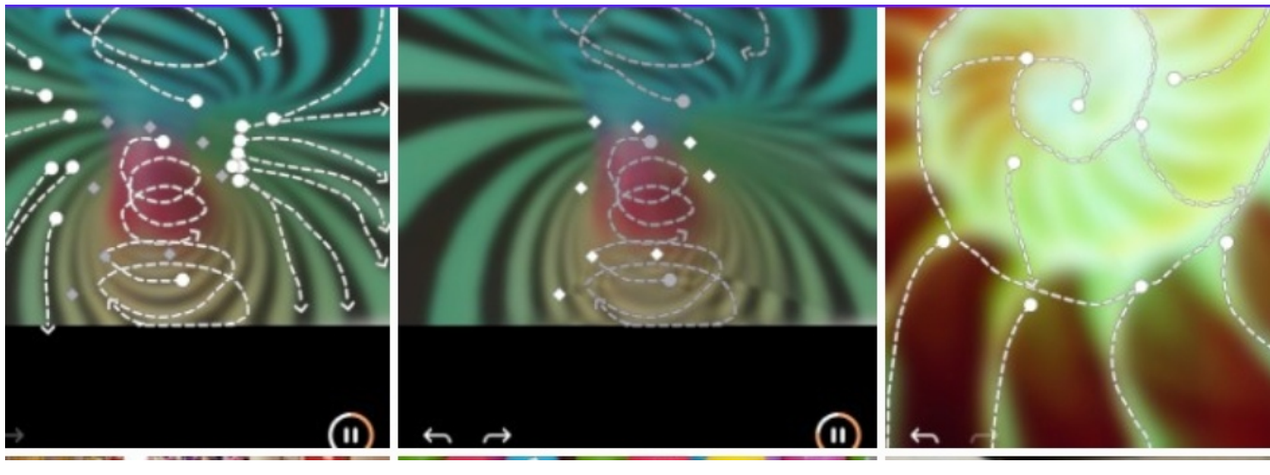


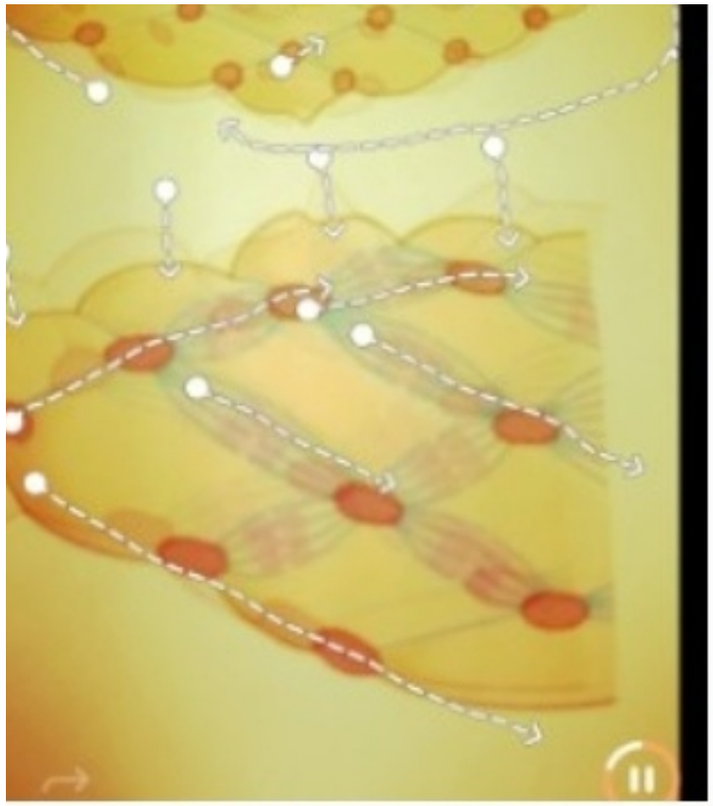


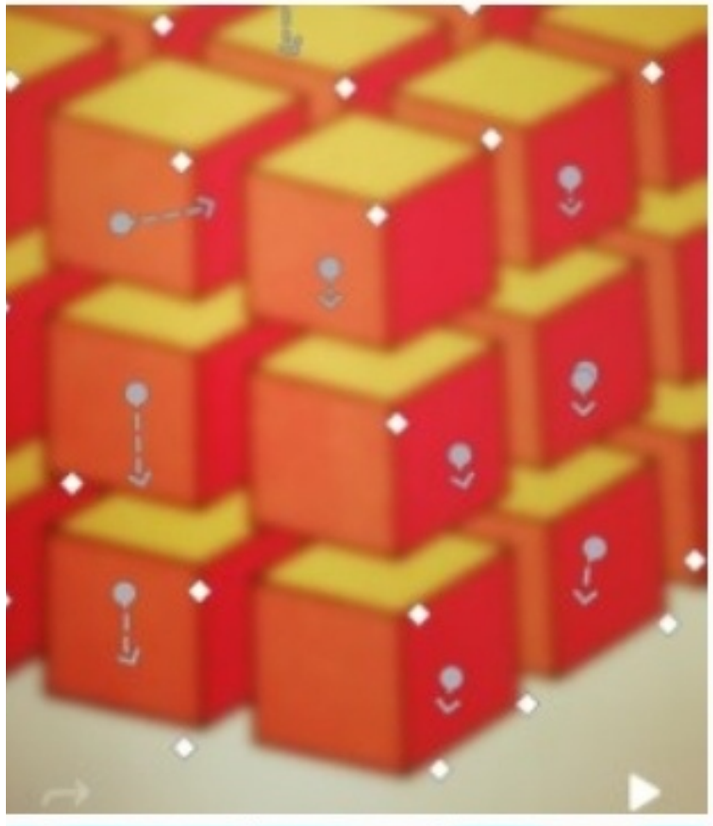
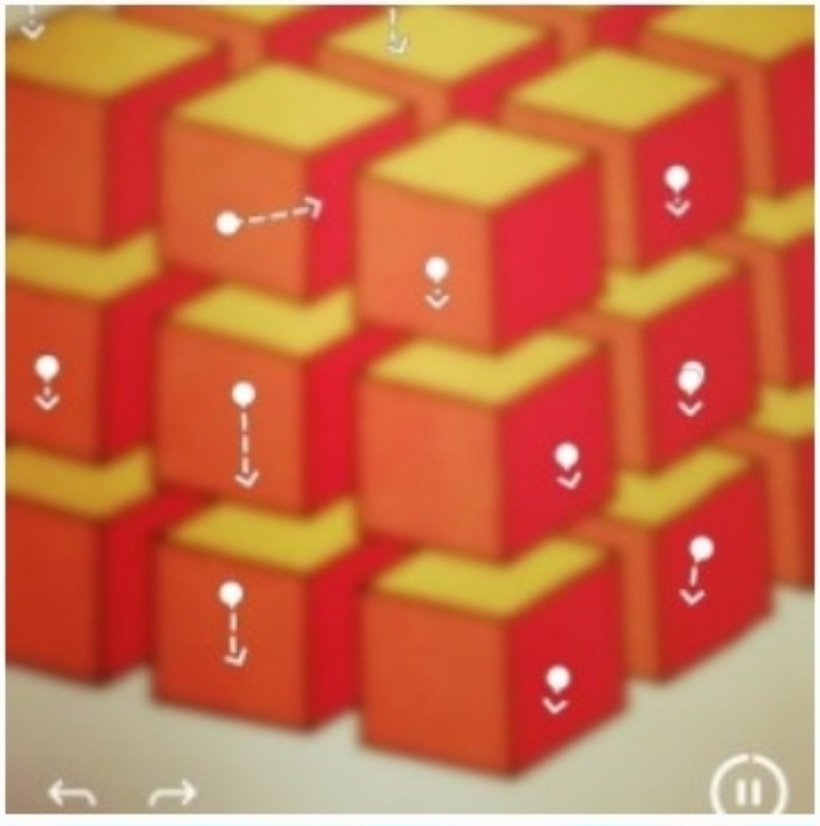
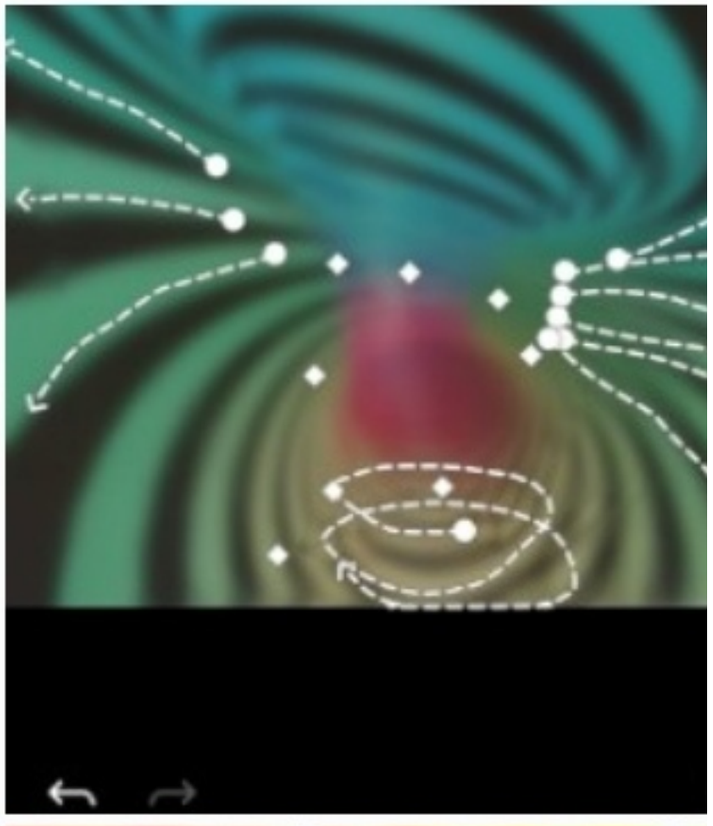
23

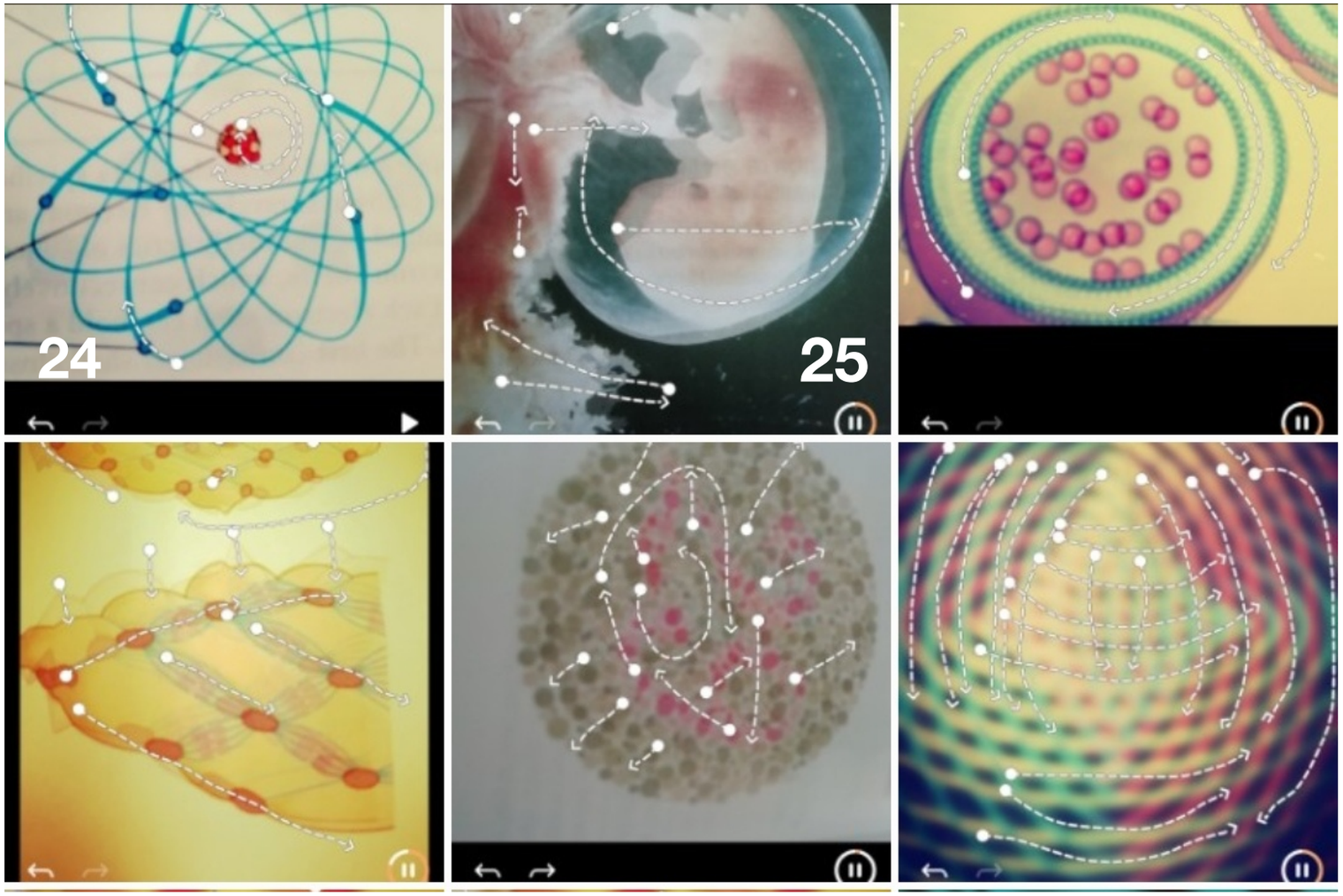
A LOOK AT MANY ANIMATION PATHS WITH SEVERAL IMAGE VARIETIES.





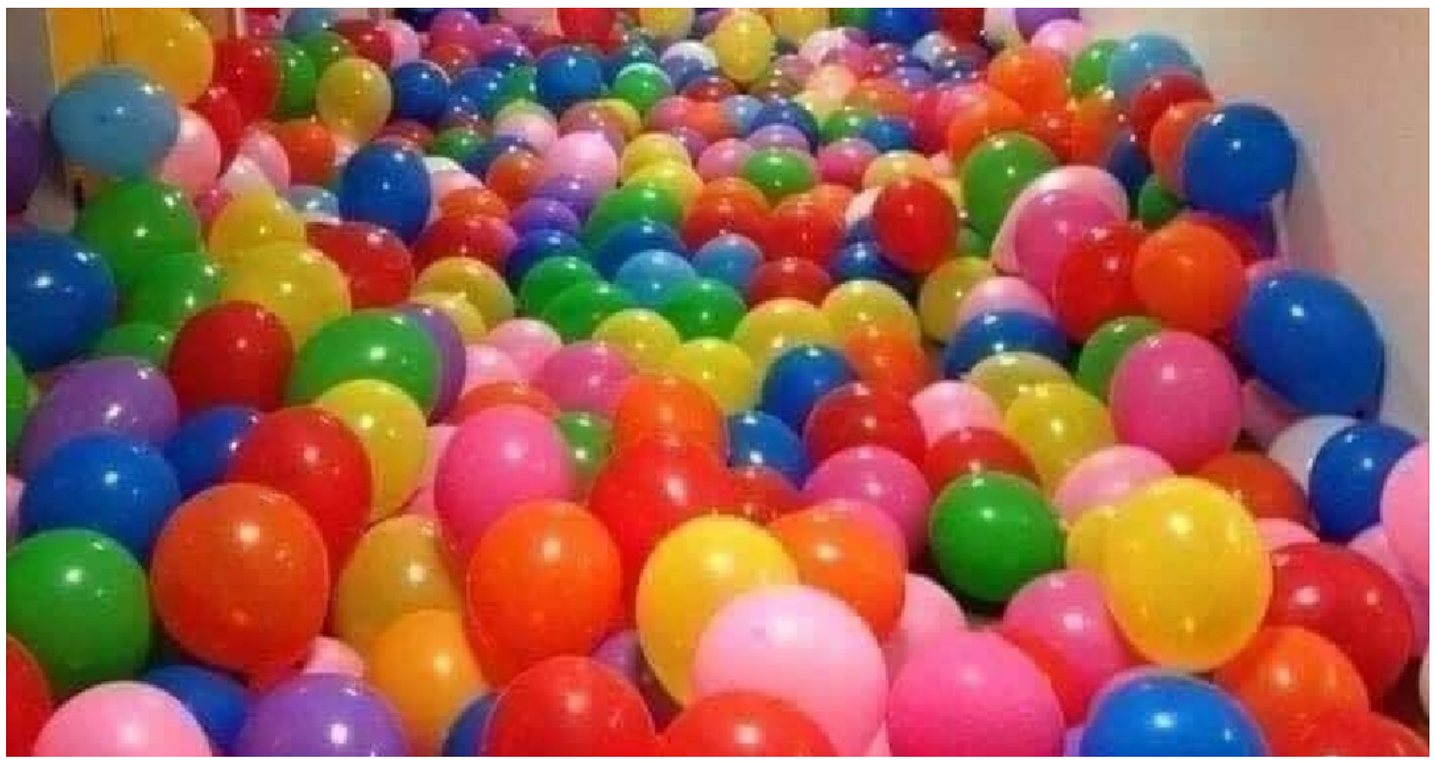


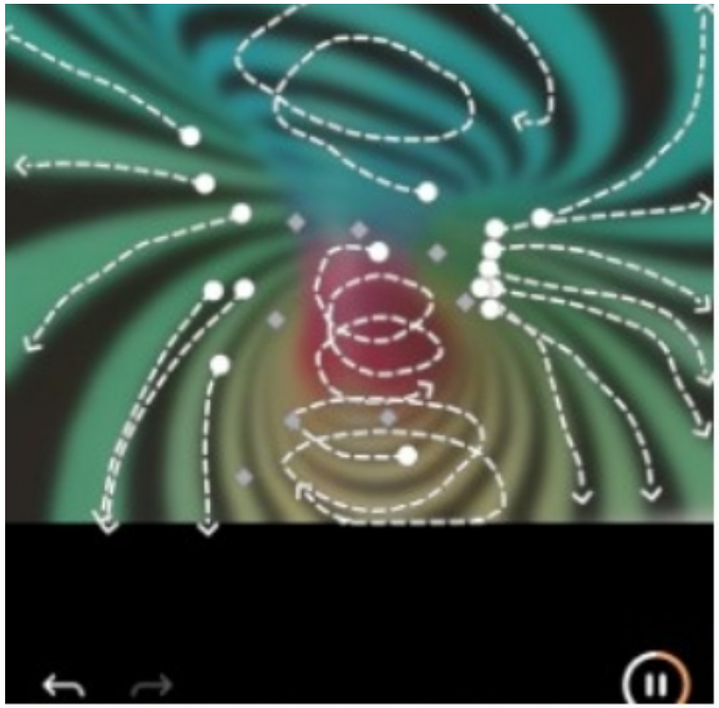




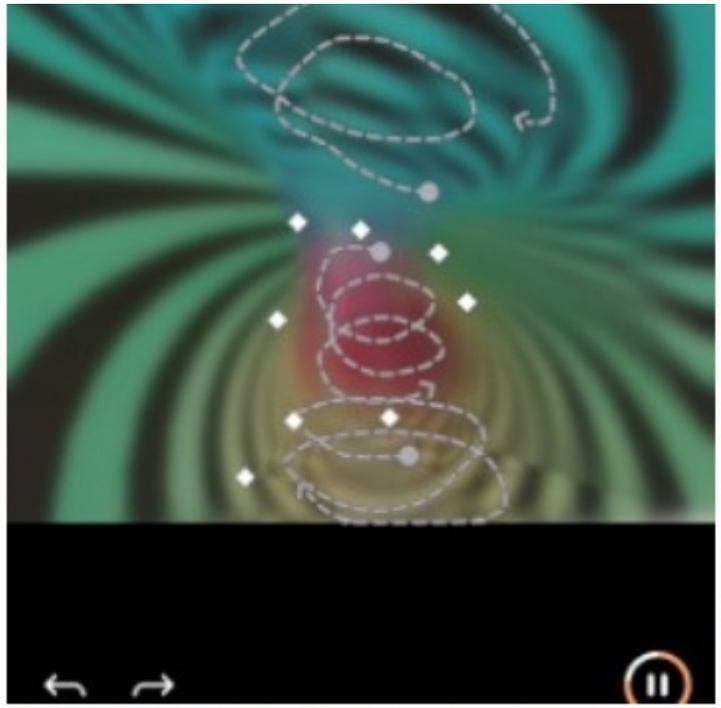


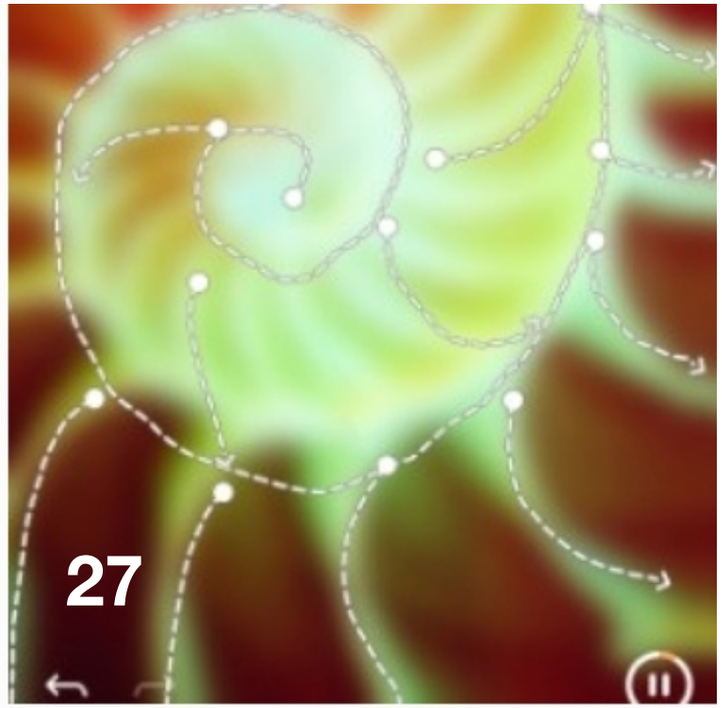
25: This looks like a baby foetus in the womb of a woman. This is the best animation path in the overall project of animation video. There are about 8 animation path on the image to generate the desire video output.

24: Image is about Atomic spins on a centred pink matter. 5 dotted paths for this image.





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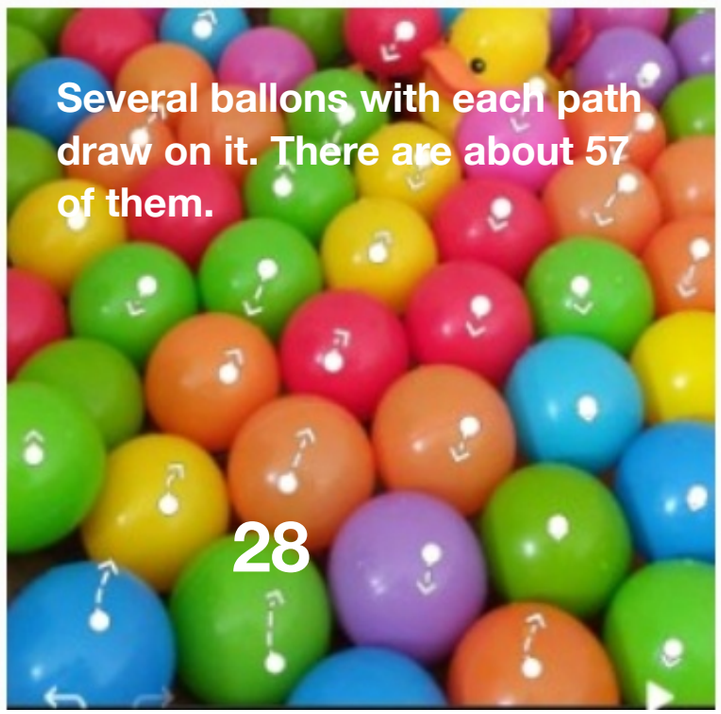

Several ballons with each path draw on it. There are about 57 of them.
28

Chapter 2:

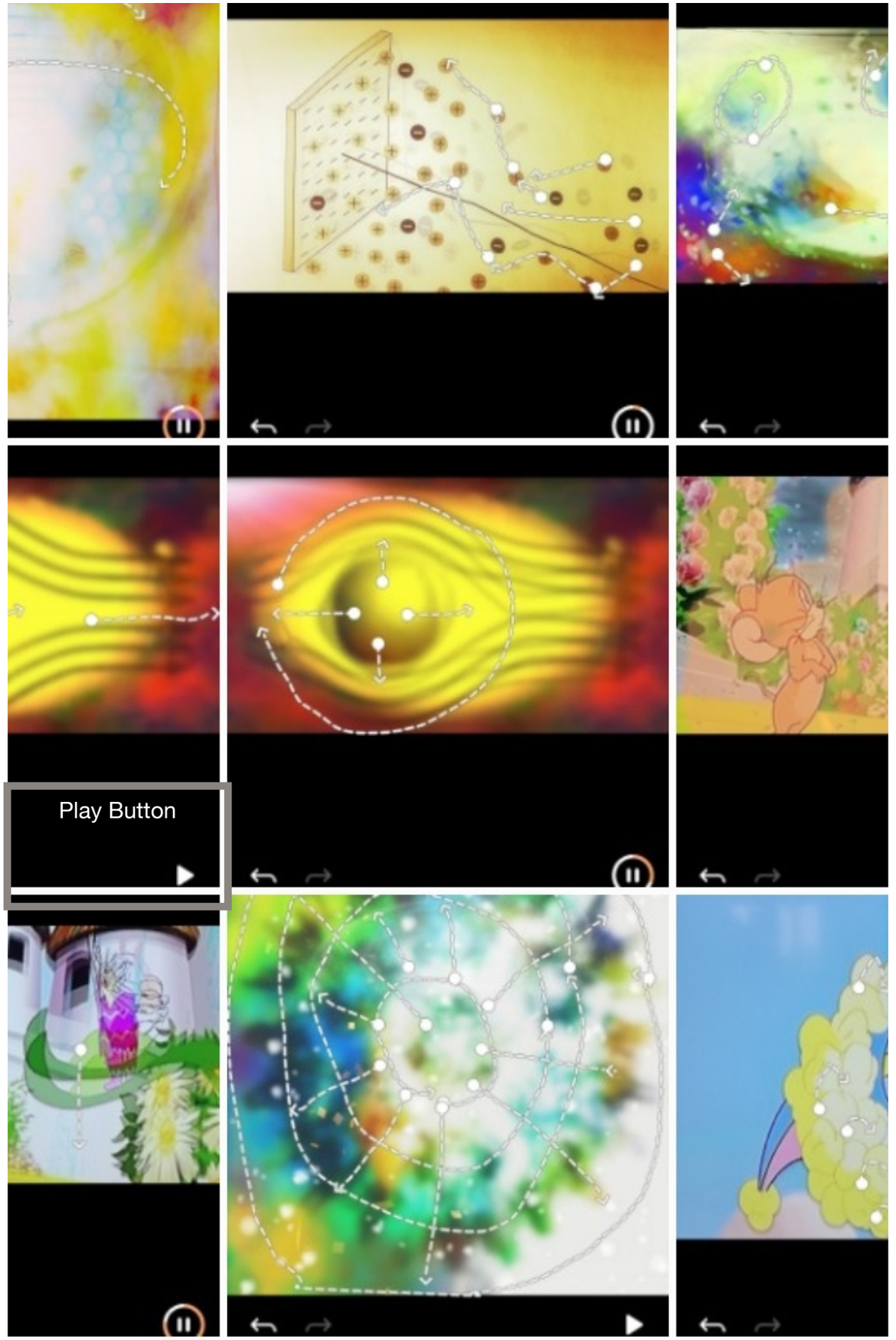
Animated Paths and Play.

1. Earlier look was on the grid view of image paths of animation.

2. This is on each animation path generative with more details of path description.

3. Path description will look at the cardinal and coordinates. Two major regions indicated as north and south from the dotted start point.

4. Again on count of similar directions of animation path.



List of Animated Paths and Plays.

1. Tom and Jerry Scene.
2. Jerry Foamy Face.
3. Viral Body.
4. Ant Swarm Carrying Vector Food.
5. Cylindrical Volumen and Tablets.
6. Triple Clocked Feet
7. Super-hot Earth core
8. Electrostatic Fields
9. Colour Balls Duck

1: Animated Path

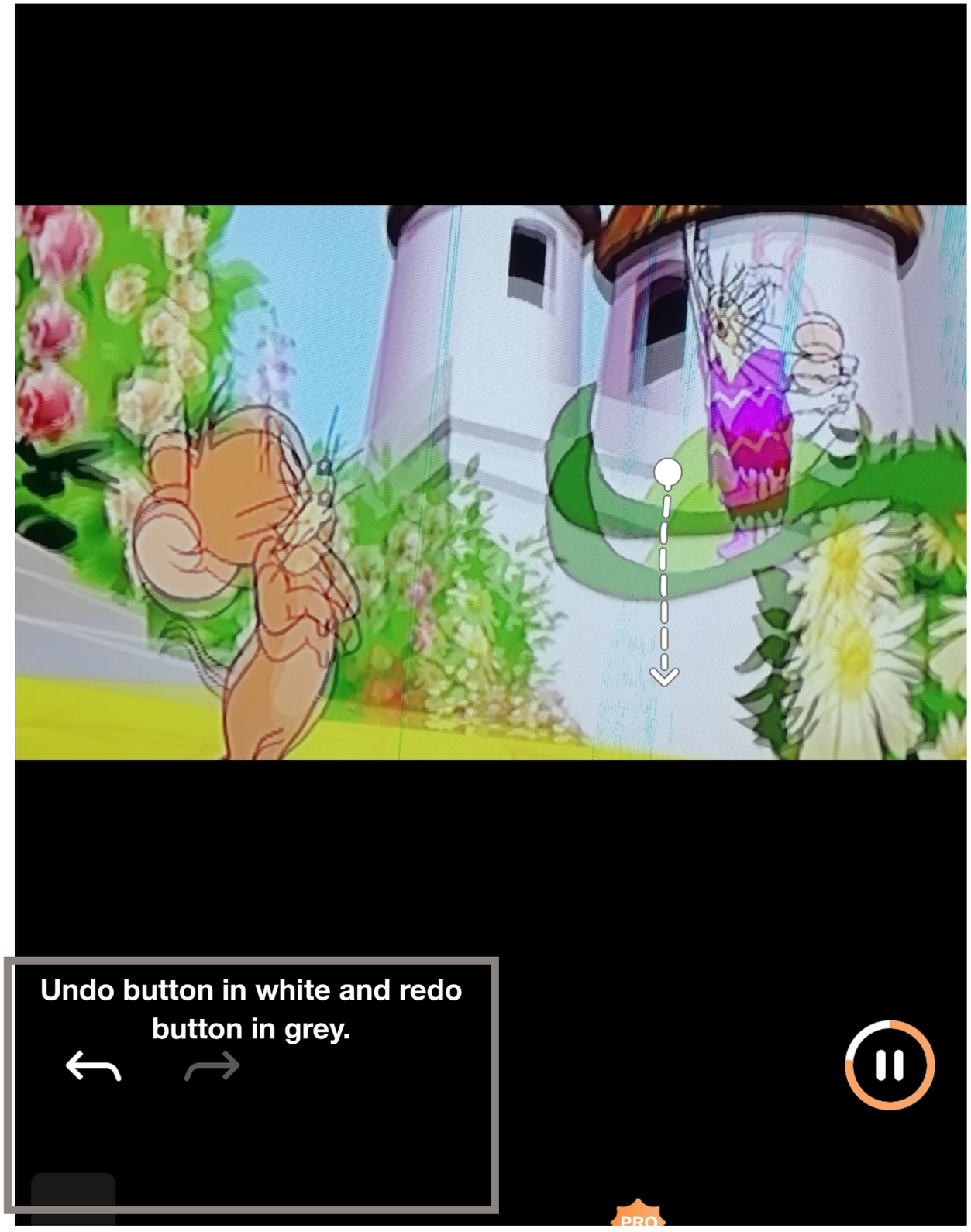
Tom and Jerry Cartoon

1. Tom and Jerry is the image path name for this scene.

2. This scene is about Tom watching a friend describing a jump from a leave of a plant.

3. The animated path is only one. This is pointing downwards and it is placed at Tom’s friend stage.

4. The length is measured with the number of dashed lines in a path (dot start-point to arrow endpoint). Here, there are about 7 dash lines. You may describe the animation cycle as the number of dashed lines.



Tom and Jerry

1.1 Animation Regions

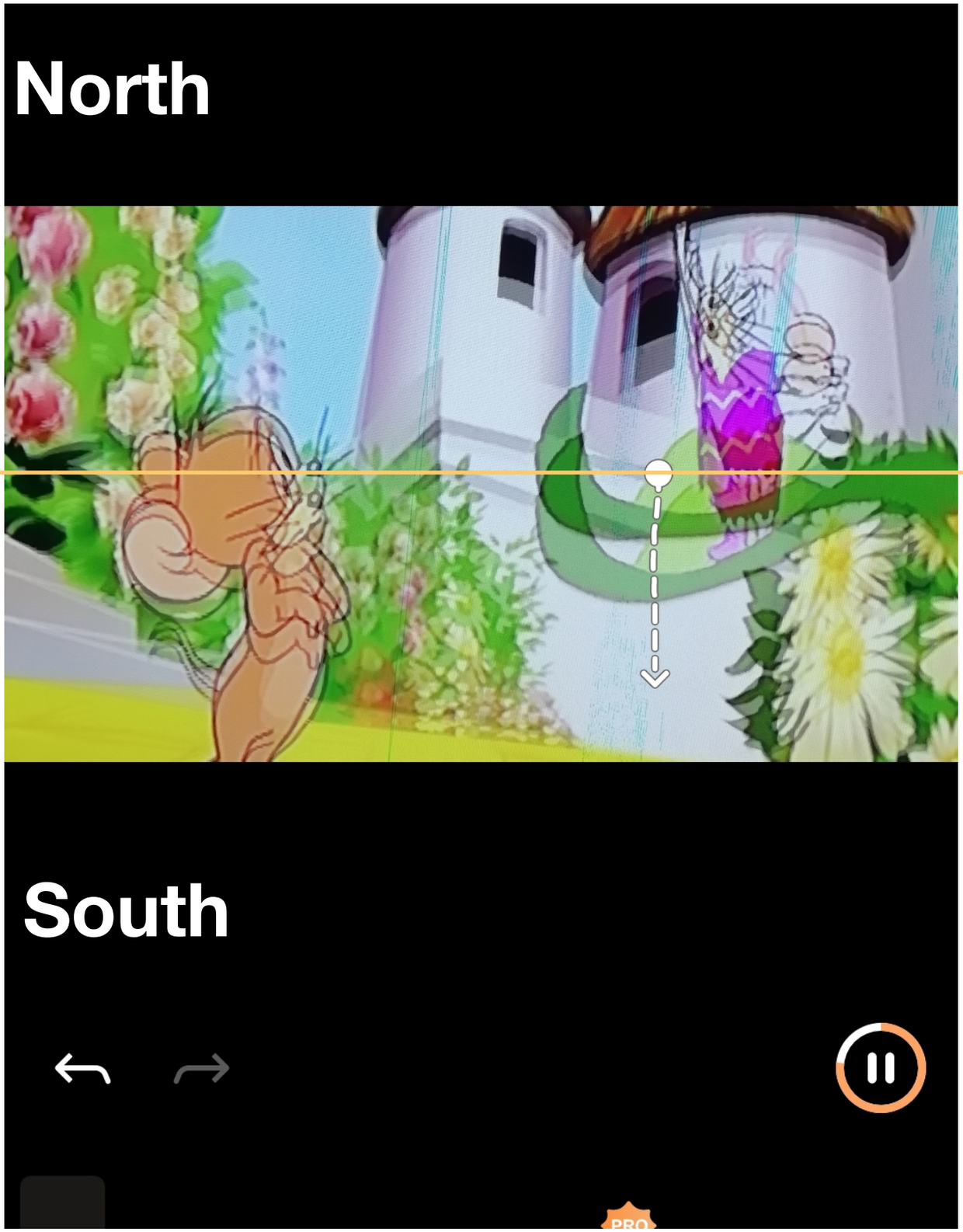
Cardinal and Coordinates

A. Tom in this scene is in the south left stage in this image.

B. Tom’s friend is the scene is in the north right stage in this image.

C. There is an interleaved point at the region separation where Tom’s head is little out into the north region and friend’s feet is little down into the south region.

D. The whole region has flowers, staircase and castle building as the background stage.



1.2 Play: The video output for this scene is about Tom’s friend jumping up and down on the leave as it points into the sky.

Play Description

2: Animated Path

Jerry Foamy Face : Tom and Jerry Cartoon.

1. Jerry foamy face is the image path name.

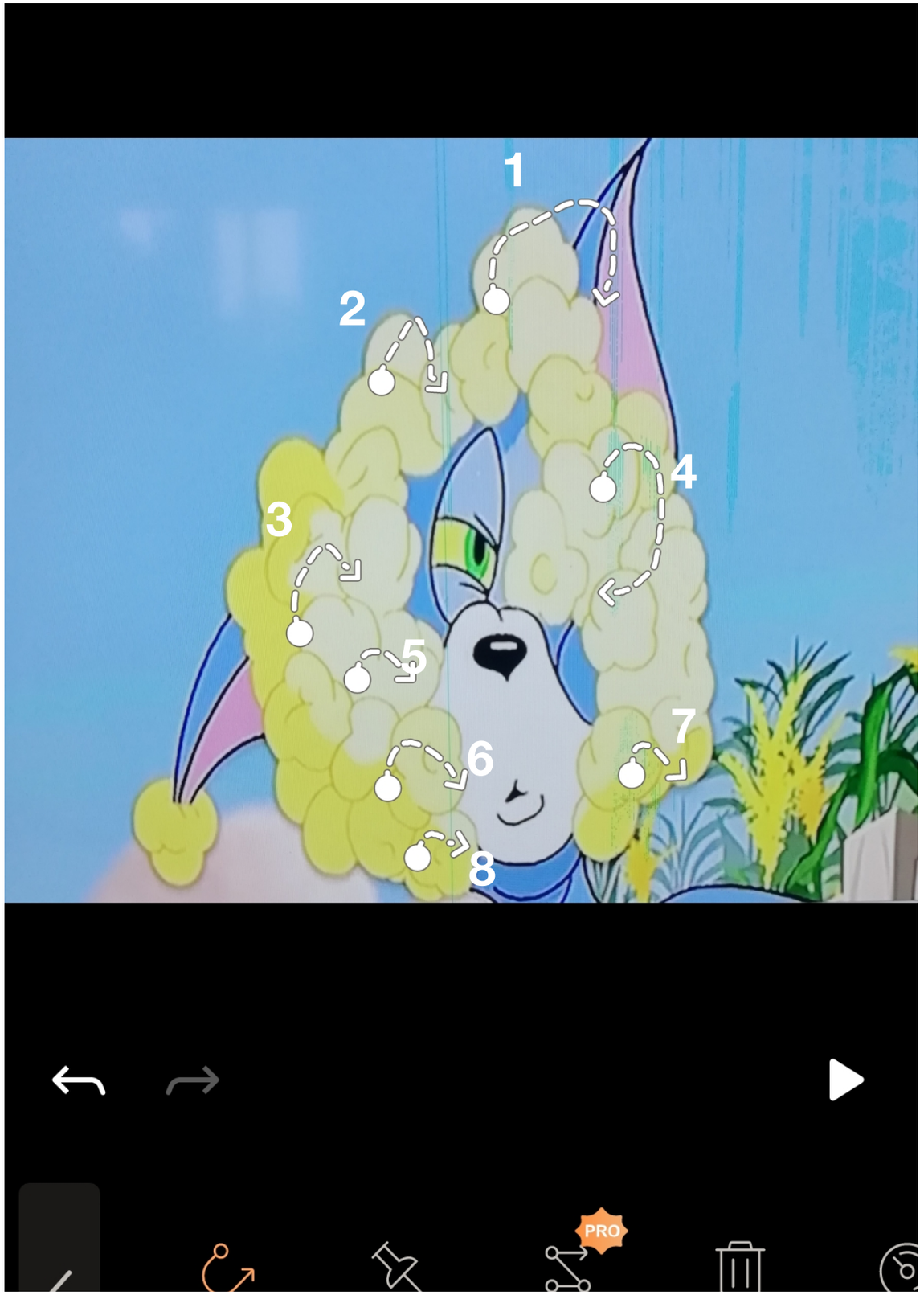
2. This is about Jerry having foamy face due to a pour of foam water from a bucket by Tom.

3.The animated path is 8 in total. It is placed around the foamy area.

4. The length of dash lines will be described with each path numbered.

Path 1: 10 Path 2: 5 Path 3: 4 Path 4: 9

Path 5: 3 Path 6: 4 Path 7: 2 Path 8: 1



Jerry Foamy Face

2.1 Animation Regions

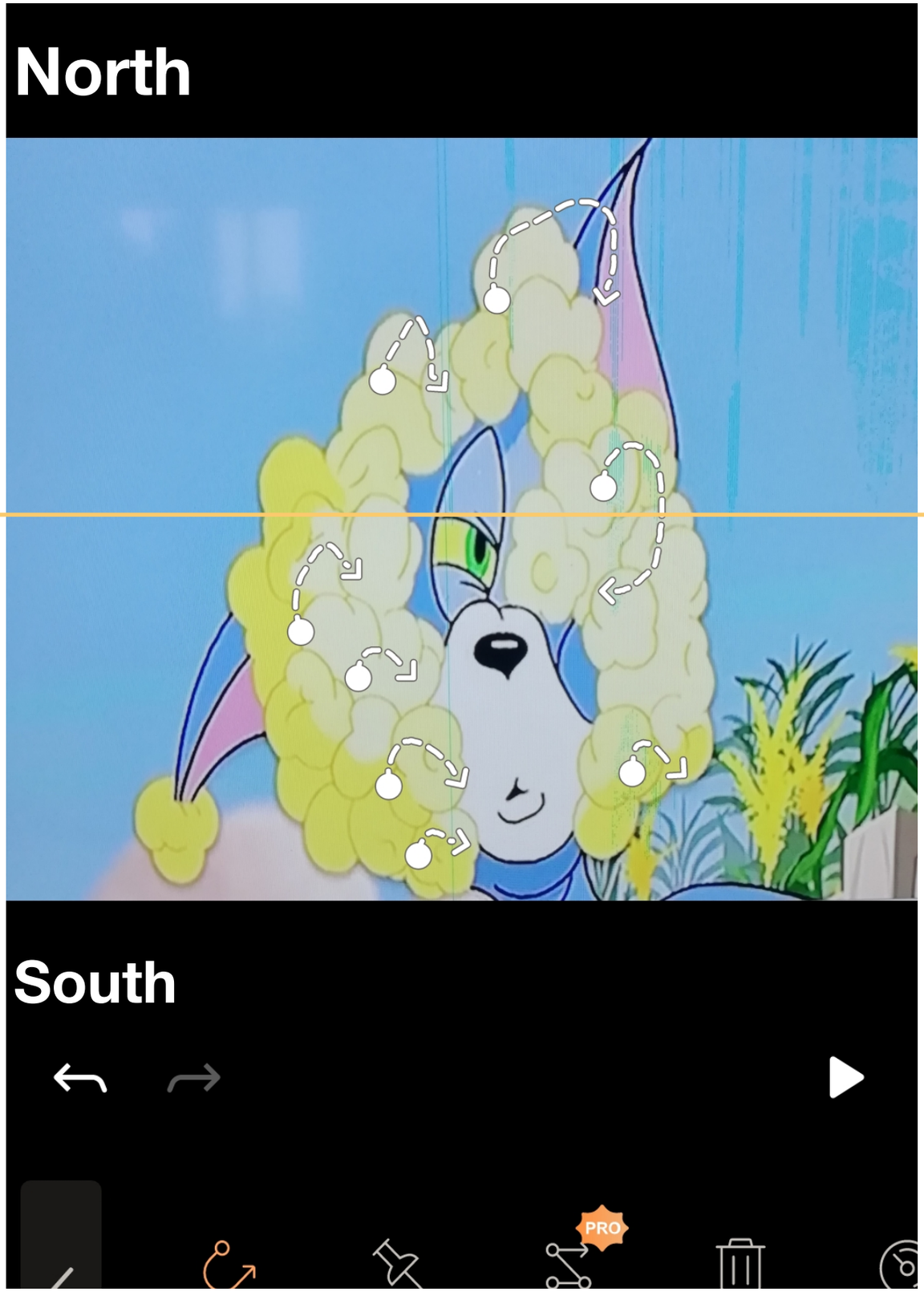
Cardinal and Coordinate

A. Jerry’s ear is in the north middle region of the scene.

B. Jerry’s mouth is in south middle region of

C. The separation region splits the head of Jerry.

D. The background scene has some flower plants and a wall.



2.2 Play: The video output for this scene is about Jerry having foam rub around its face.

3: Animated Path

Viral Body

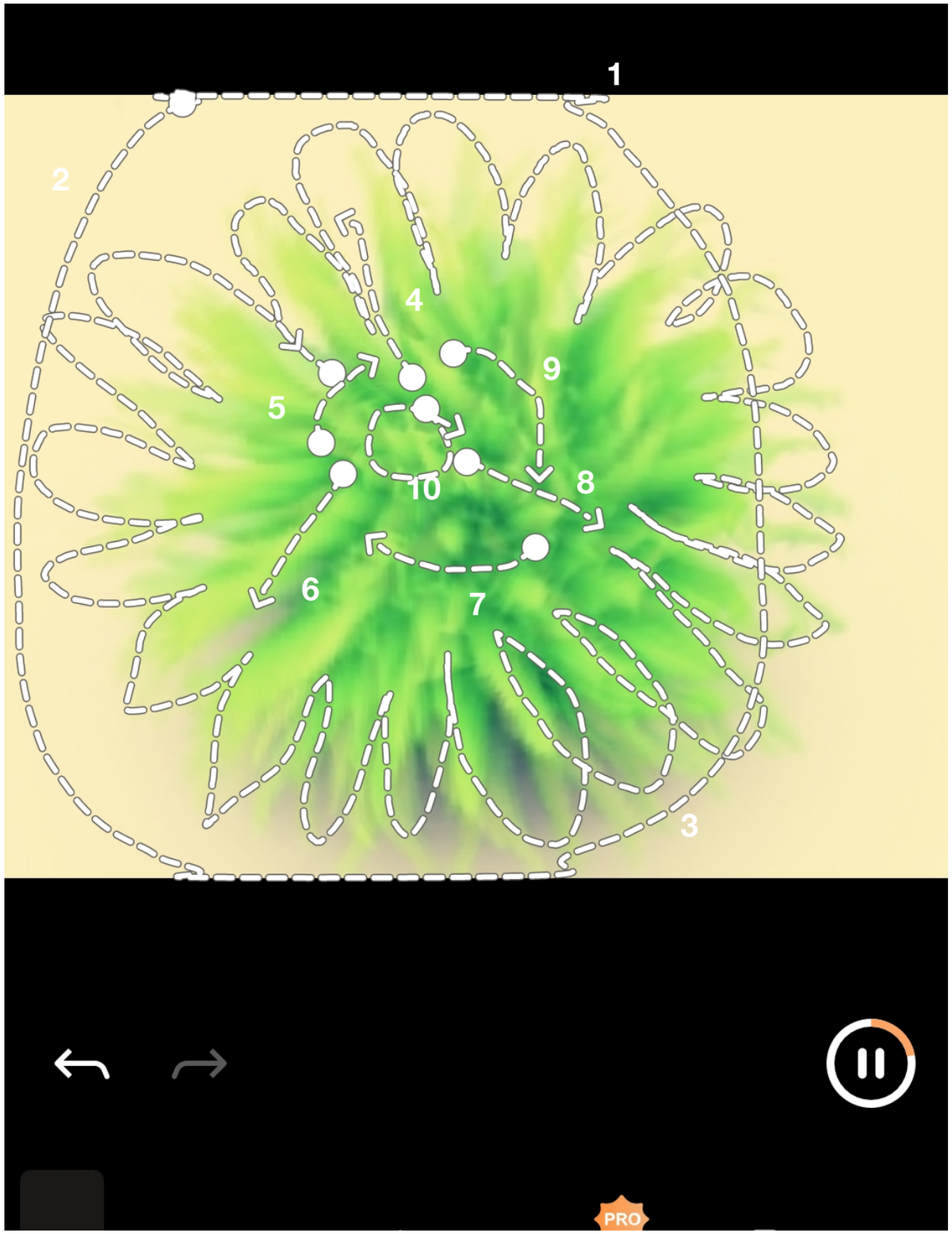
1. Viral body is the animated path name.

2. This is about the viral body showing its activation and liveness.

3. The viral body has animated paths of 10.

4. The length of the dash lines are:

Path 1: 15, Path 2: over 45, Path 3: over 60, Path 4: 6, Path 5: 3, Path 6: 5, Path 7: 5 and Path 8: 4



Viral Body

3.1 Animated Regions

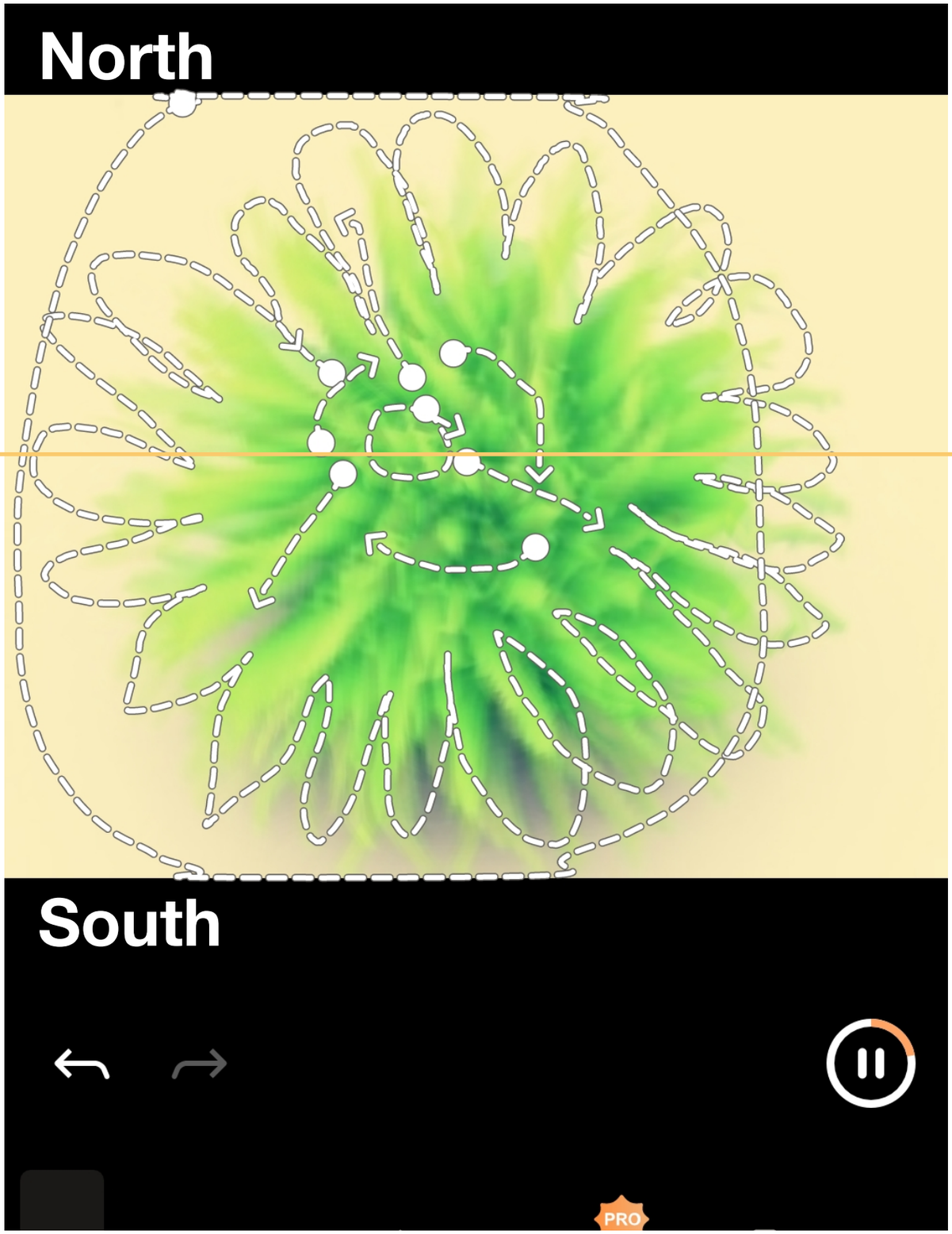
Cardinals and Coordinates

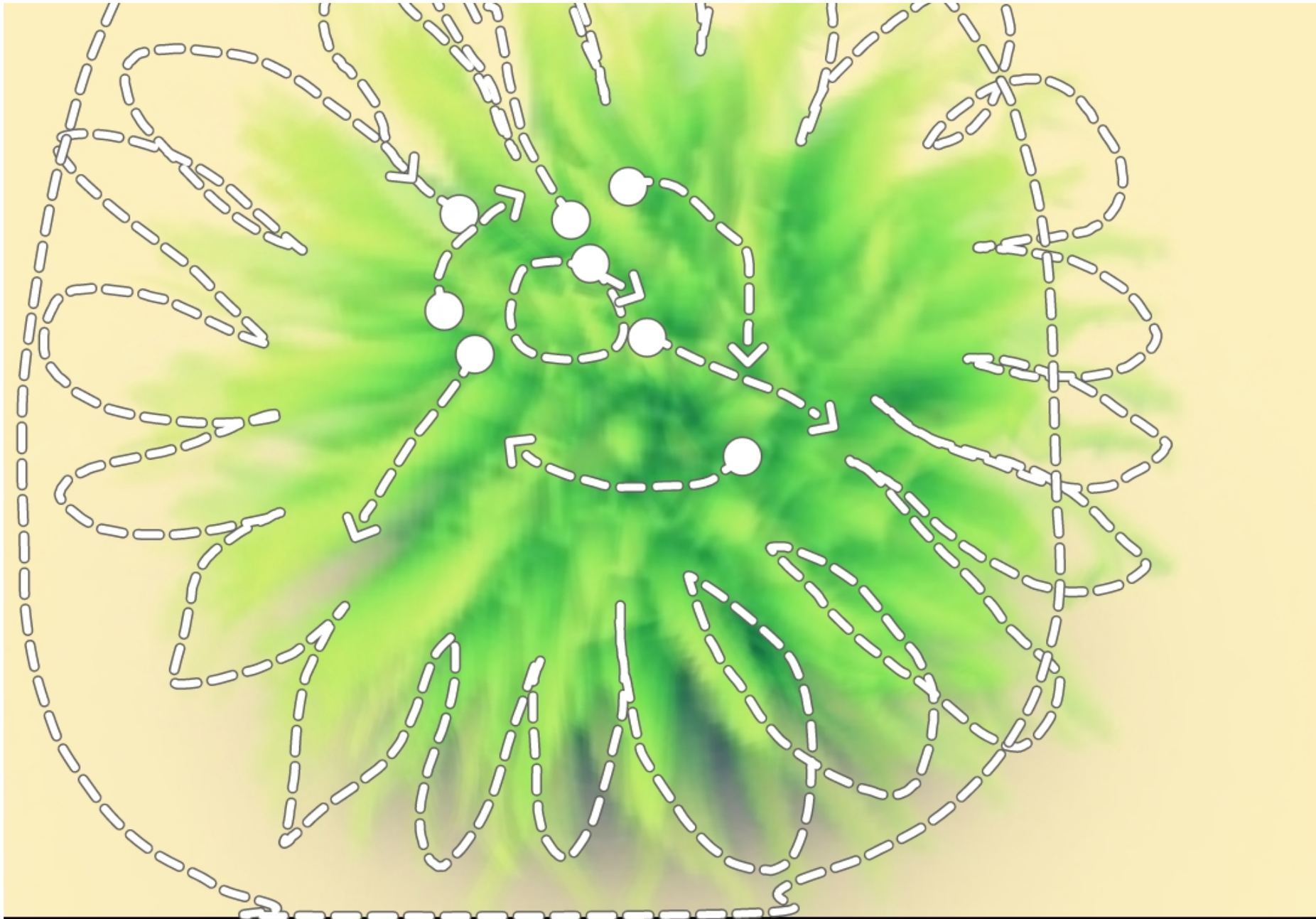
1. The viral body has 6 animated paths in the north region.

2. The viral body has 3 animated paths in the south region.

3. There are three pointing down animated paths.

4. There are about three circular animated paths.





3.2 Play: The video output for this scene is about the viral body’s liveness showing its activation.

4: Animated Path

Ant Swarm Carrying Vector Food.

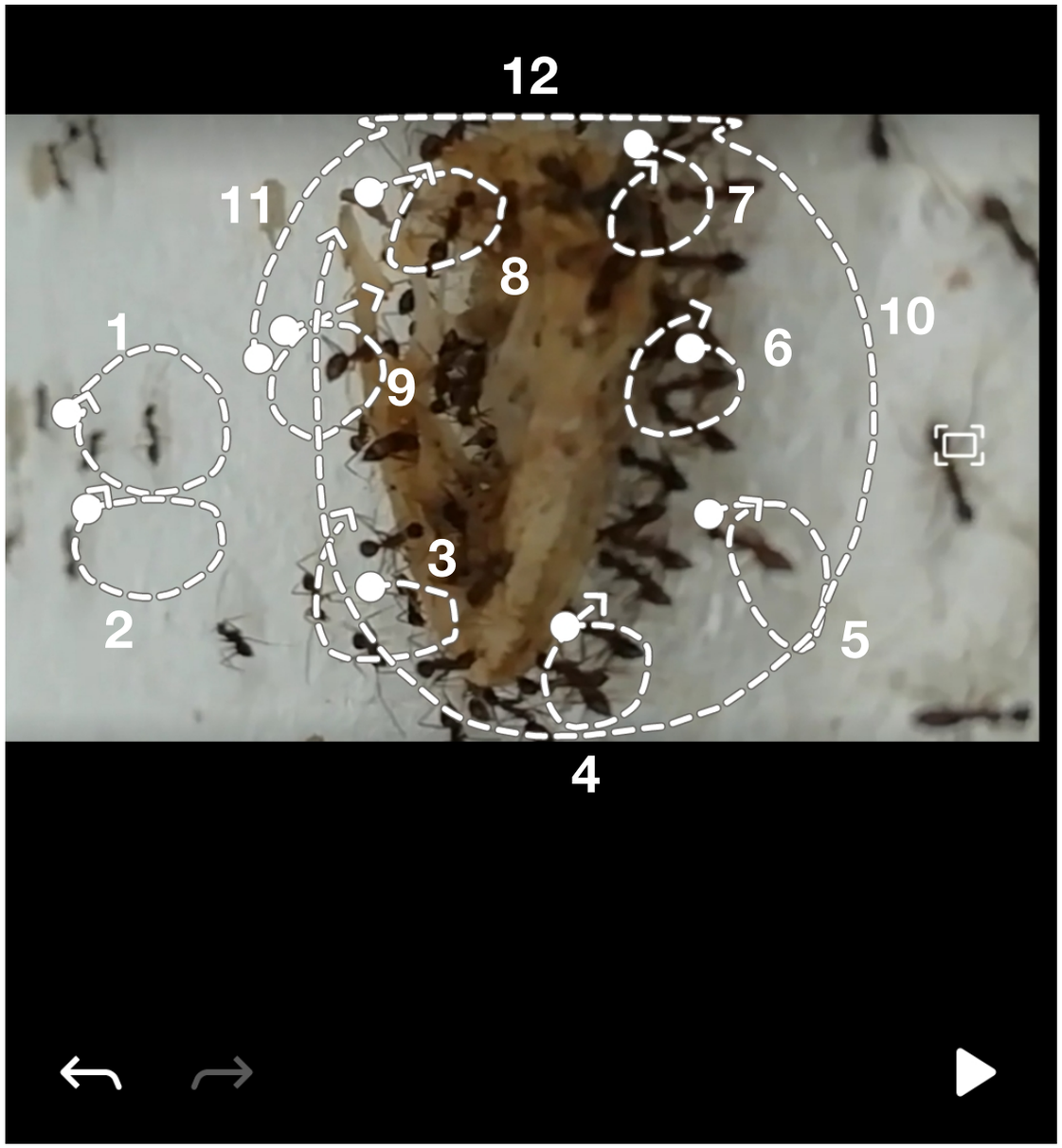
1. Ant swarm is the animated path name.

2. This is about ant swarm carrying some leftover flour-baked food along a wall of a building.

3. It has animated path of 12.

4. The length of the dash lines:

Path 1: 14, Path 2: 12, Path 3: 12, Path 4: 10, Path 5: 12, Path 6: 11, Path 7: 10, Path 8: 10, Path 9: 12, Path 10: over 60, Path 11: 8 and Path 12: 12.



Ant Swarm

4.1 Animated Region

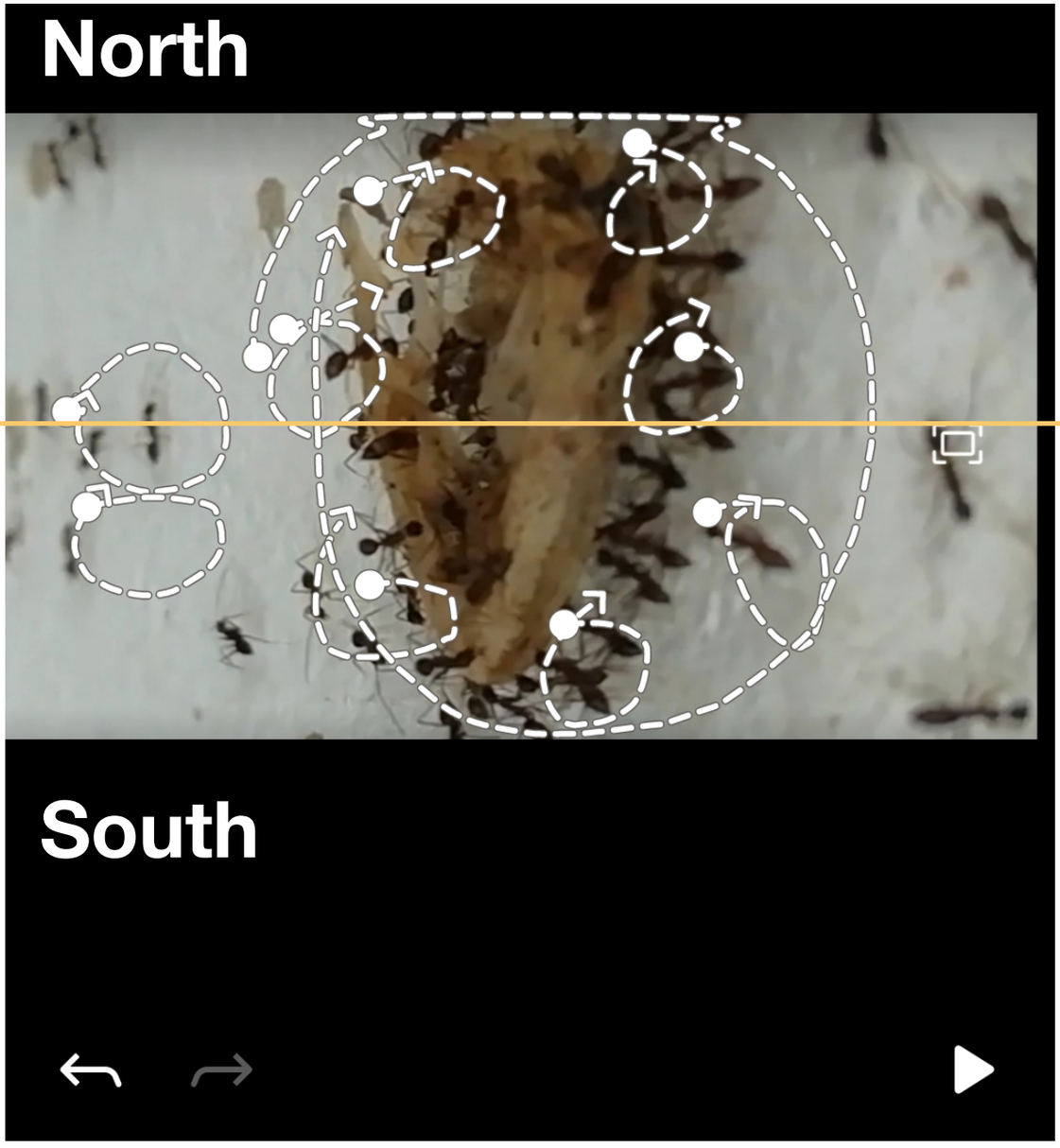
Cardinals and Coordinates.

1. There are about four animated paths in the north region.

2. There are about four animated paths in the south region.

3. There are about 1 animated path in the interleaved point of the separated region.

4. There are about 10 circular animated paths in the scene.



4.2 The video output for this scene is about ants of more than 44 carrying a leftover baked-food along a wall building at a home.

5: Animated Path

Cylindrical Volume and Tablets

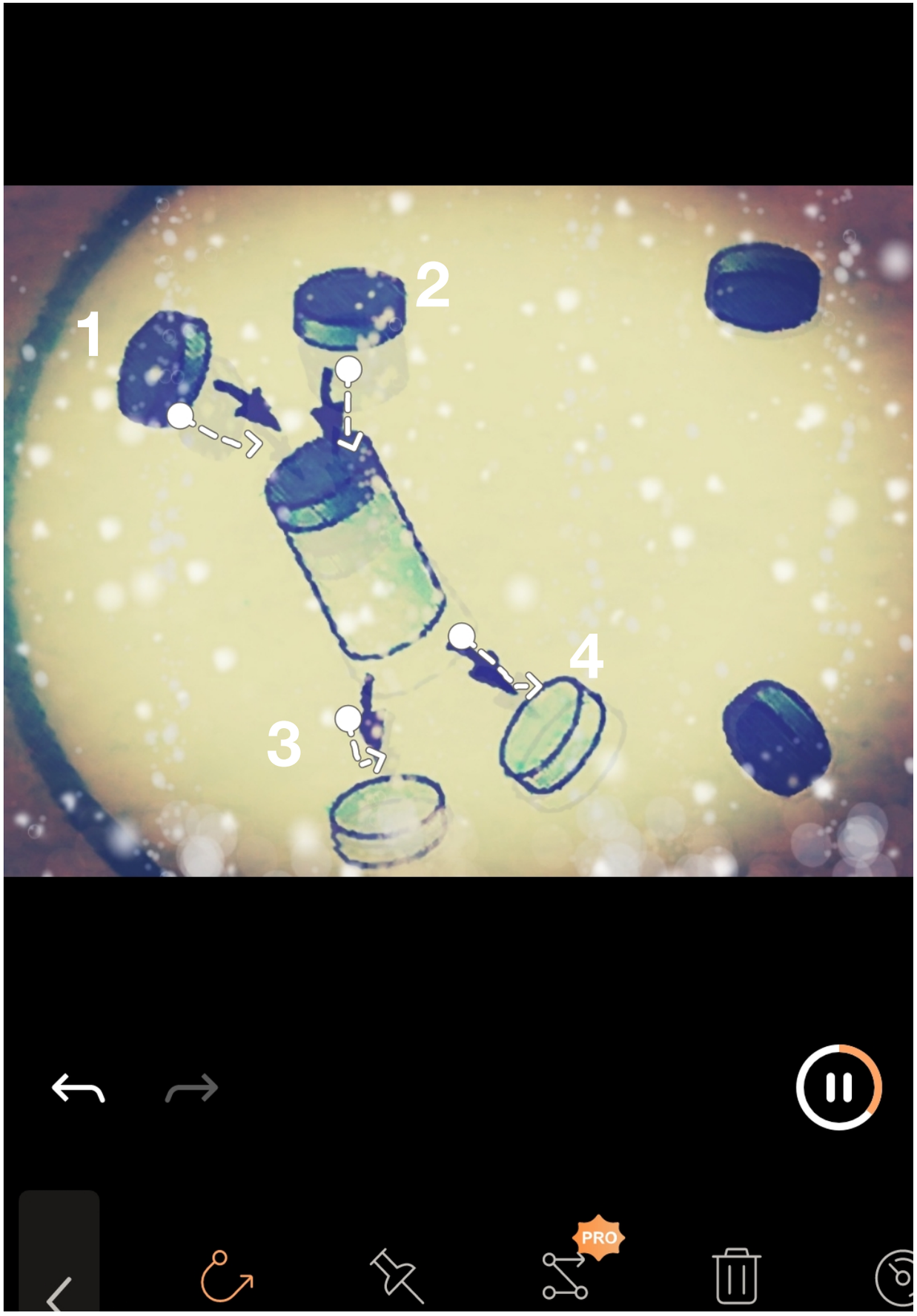
The animated path name is called cylindrical volume tablets.

This is about some tablets moving up and down to a cylindrical volume.

There are about four animated paths in this scene alone.

The length of dash lines :

Path 1: 2, Path 2: 2, Path 3: 2 and Path 4: 3



Caption

5.1: Animated Region

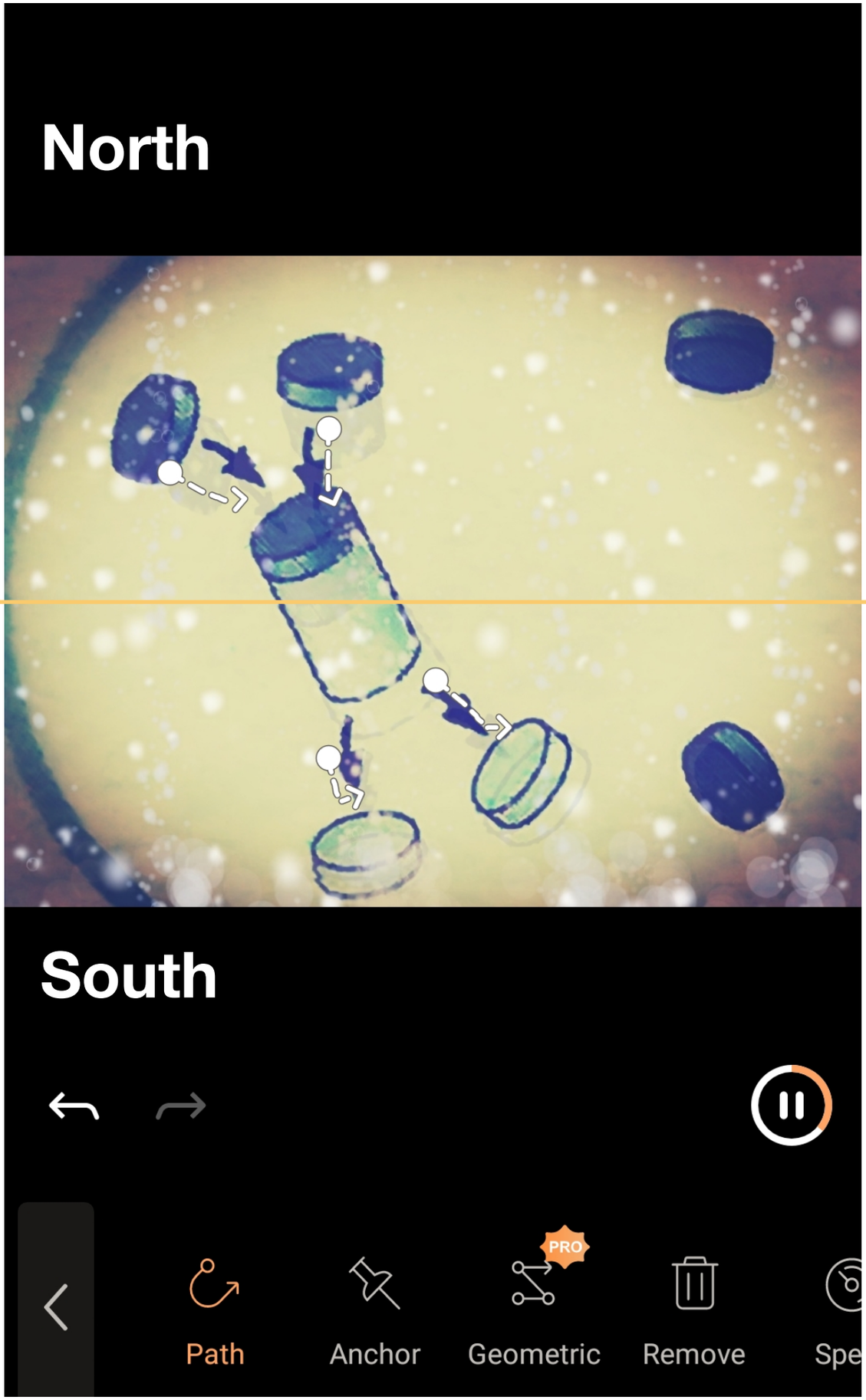
Cardinal and Coordinates.

1. There are two animated paths in the north region.

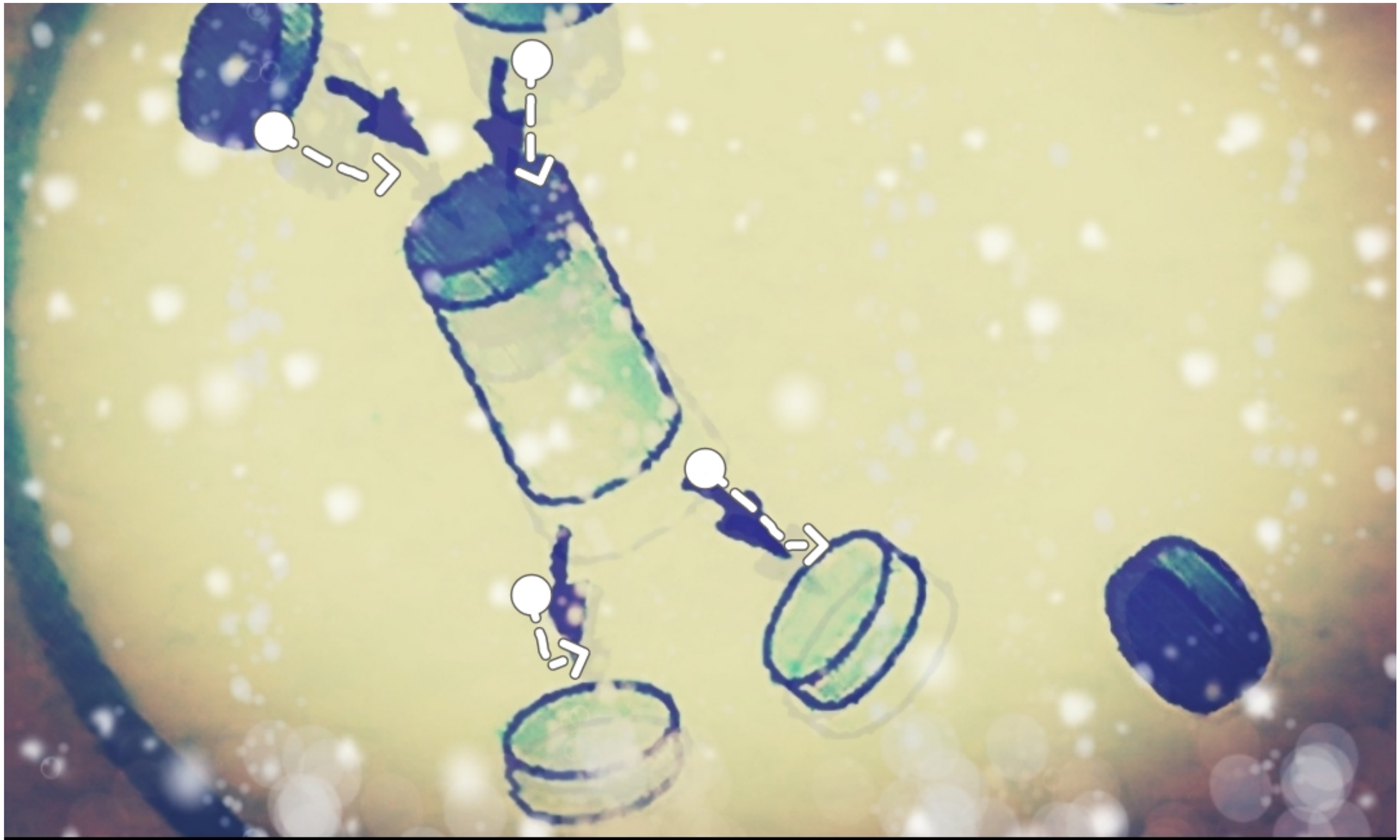
2. There are two animated paths in the south region.

3. There are four pointing down arrows.

4. There are three tablets in each region with an interleaved cylindrical volume.



Cylindrical Volume



5.2 This video output is about some six tablets pushing down and up on a cylindrical volume.

Caption

6: Animated Path

Triple Clocked Feet

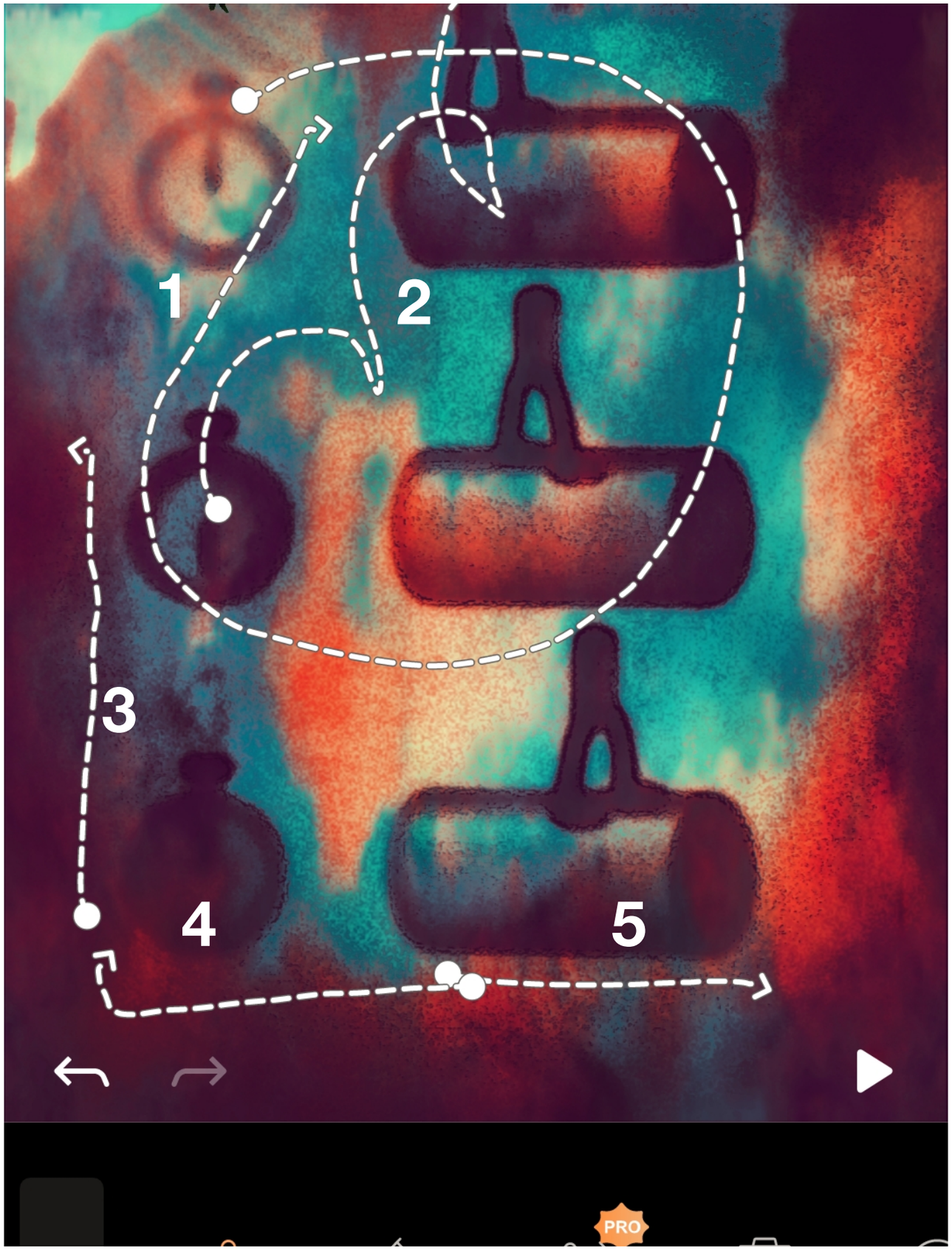
Triple clocked feet is the animation path name.

There are about five animated paths in the animation.

This is about some three headless feet walking on a cylindrical volume and parallel is a clock each.

The length of dash lines:

Path 1:71, Path 2:42, Path 3:17, Path 4:15 and Path 5: 10.



Triple Clock Feet

6.1: Animated Region

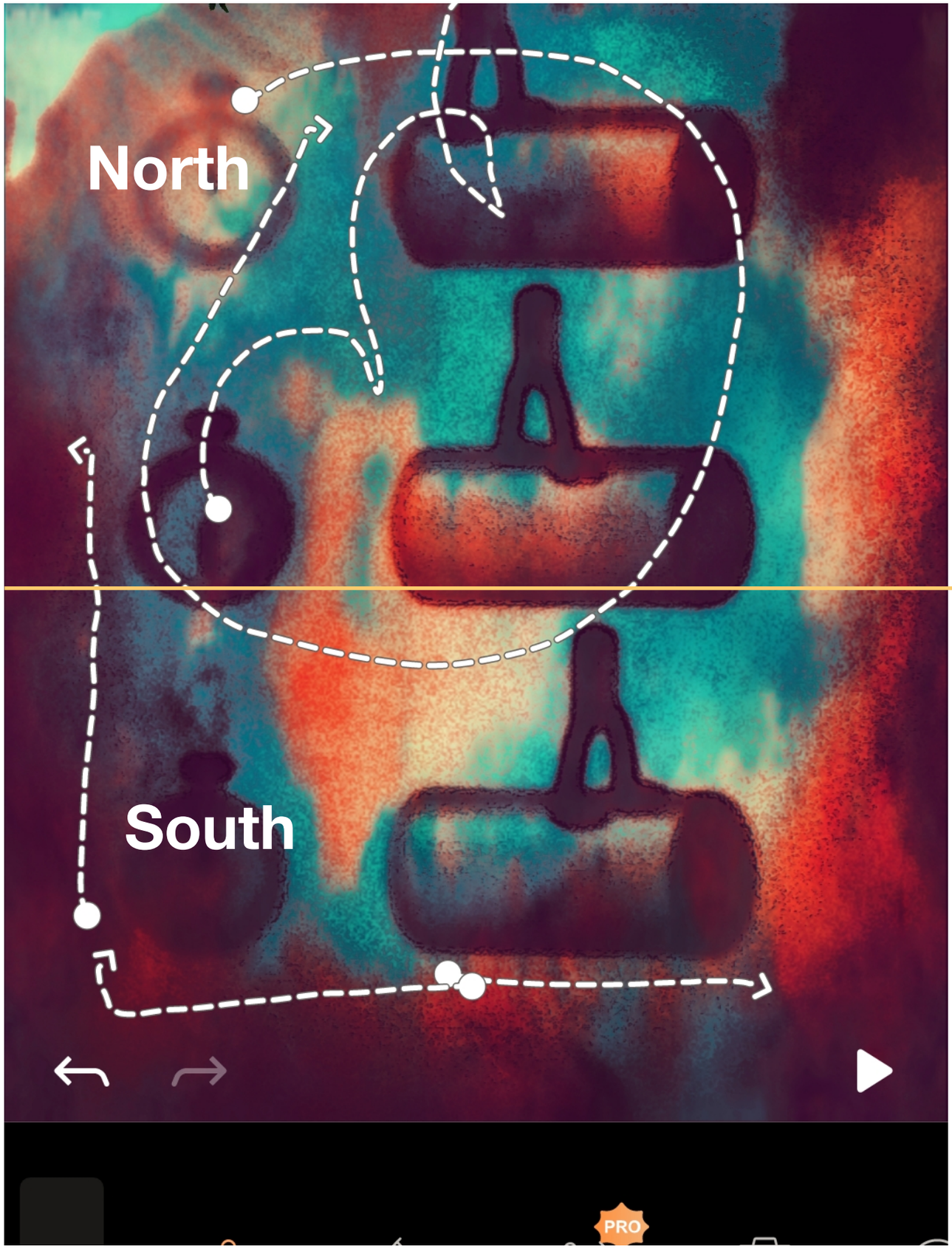
Cardinal and Coordinates

1. With arrow pointers, there are three animated paths in the north region.

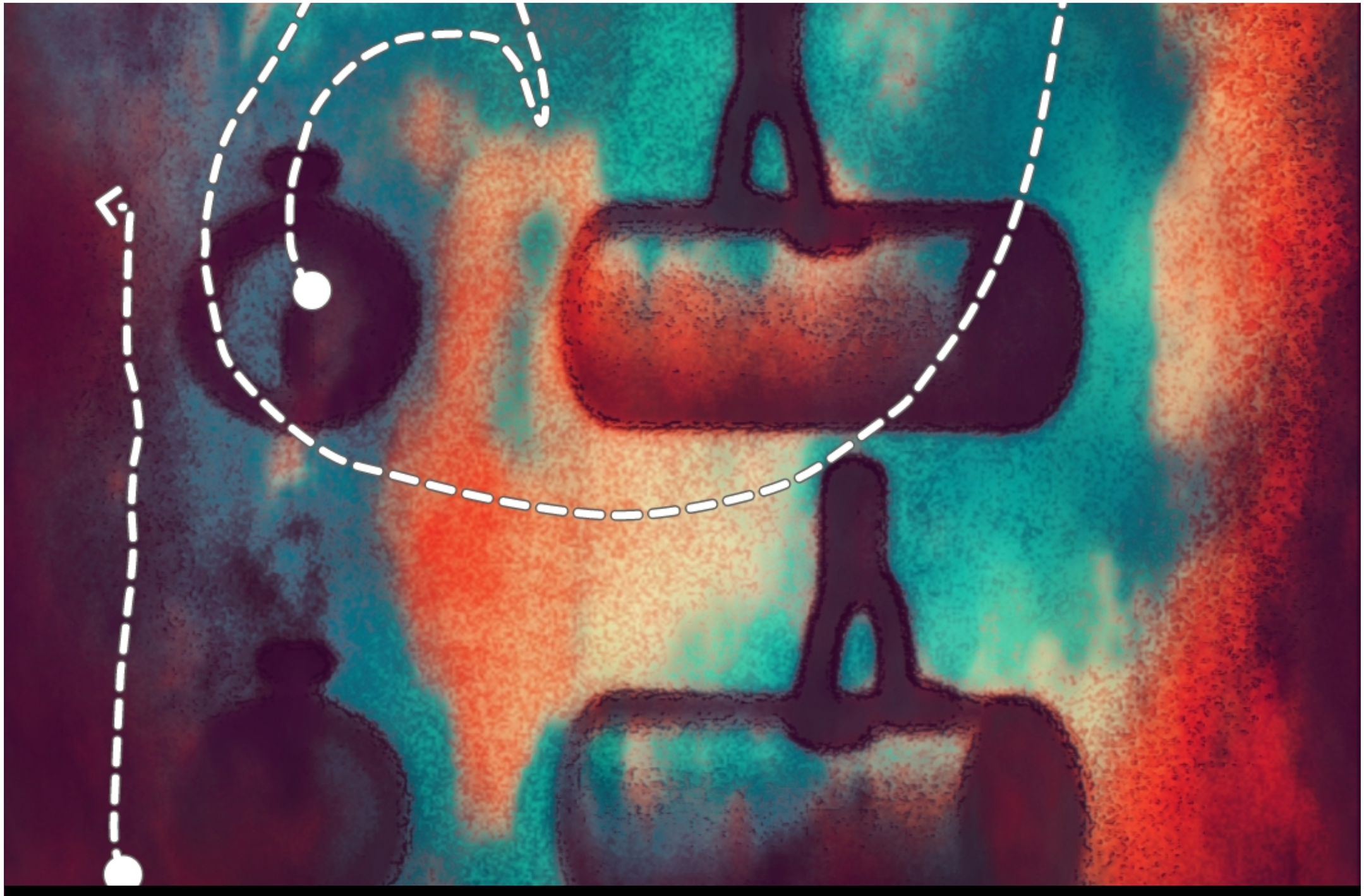
2. There are two animated paths in the south region.

3. There are three pointing up animated arrows in the paths.

4. There is one zig-zag path and one circular path in the animation scene.



Triple Clock Feet



6.2 This is a video output on three clocks and three headless feet walking on a cylindrical distance.

7: Animated Path

Superhot EarthCore

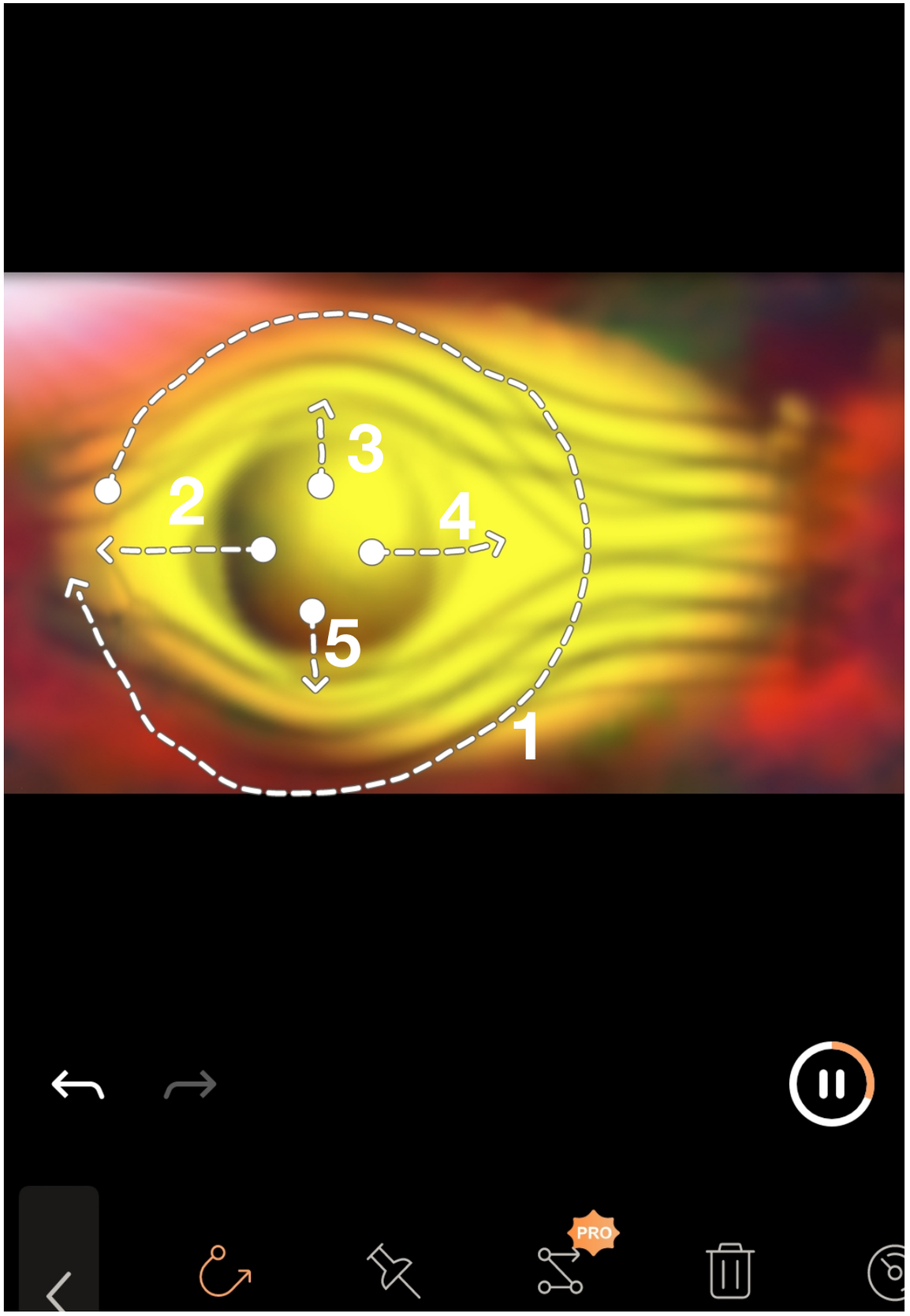
Super-hot earth core is the animated path name.

This is about flares of hot waves moving from an earth core with each streamlines of wave showing.

There are about five animated paths.

The length of dash lines:

Path 1: 56, Path 2:5 , Path 3:2 , Path 4:4 and Path 5: 2.



Caption

7.1: Animated Region

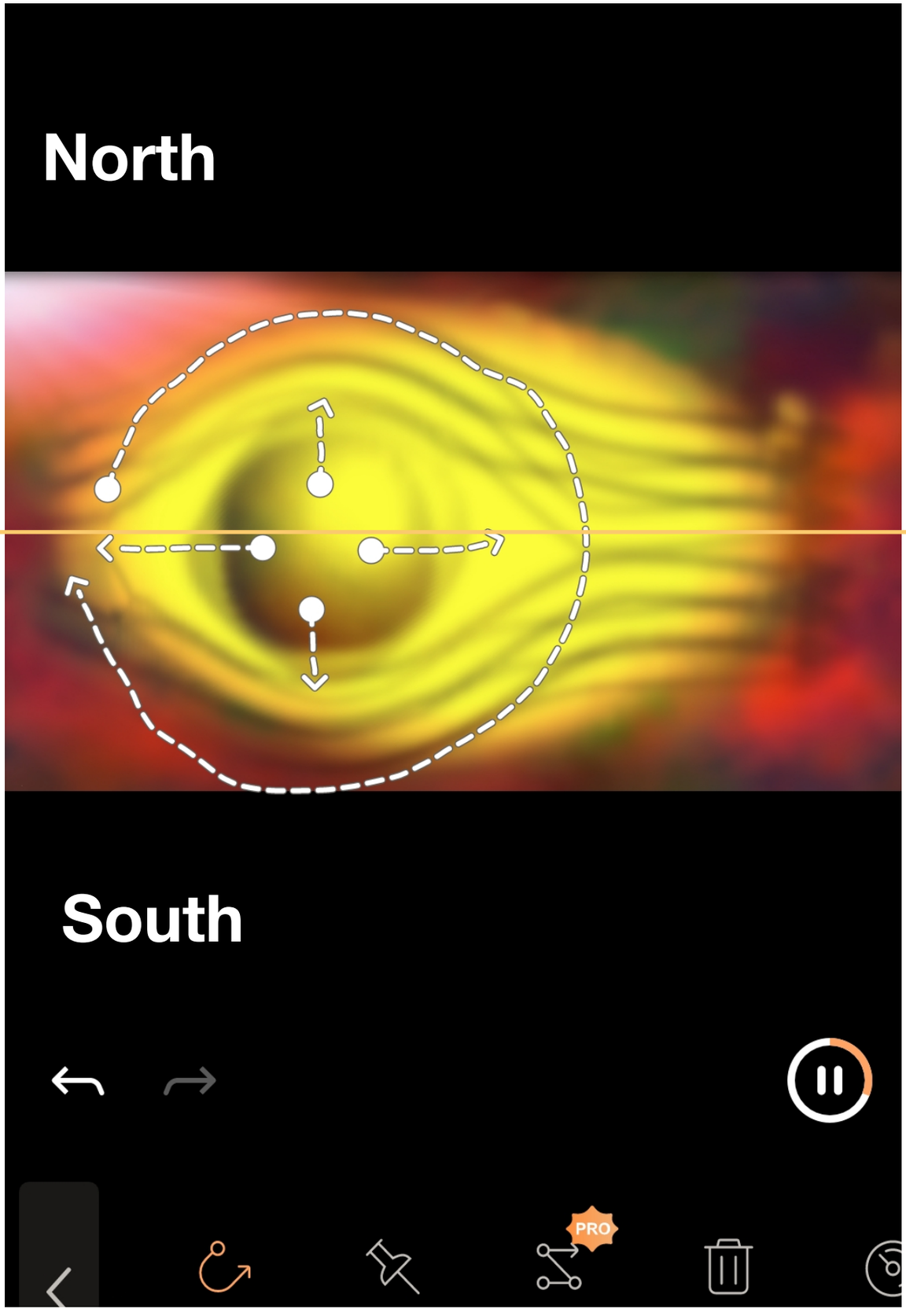
Cardinal and Coordinates

1. In the north region, there is one upwards pointing animation arrow.

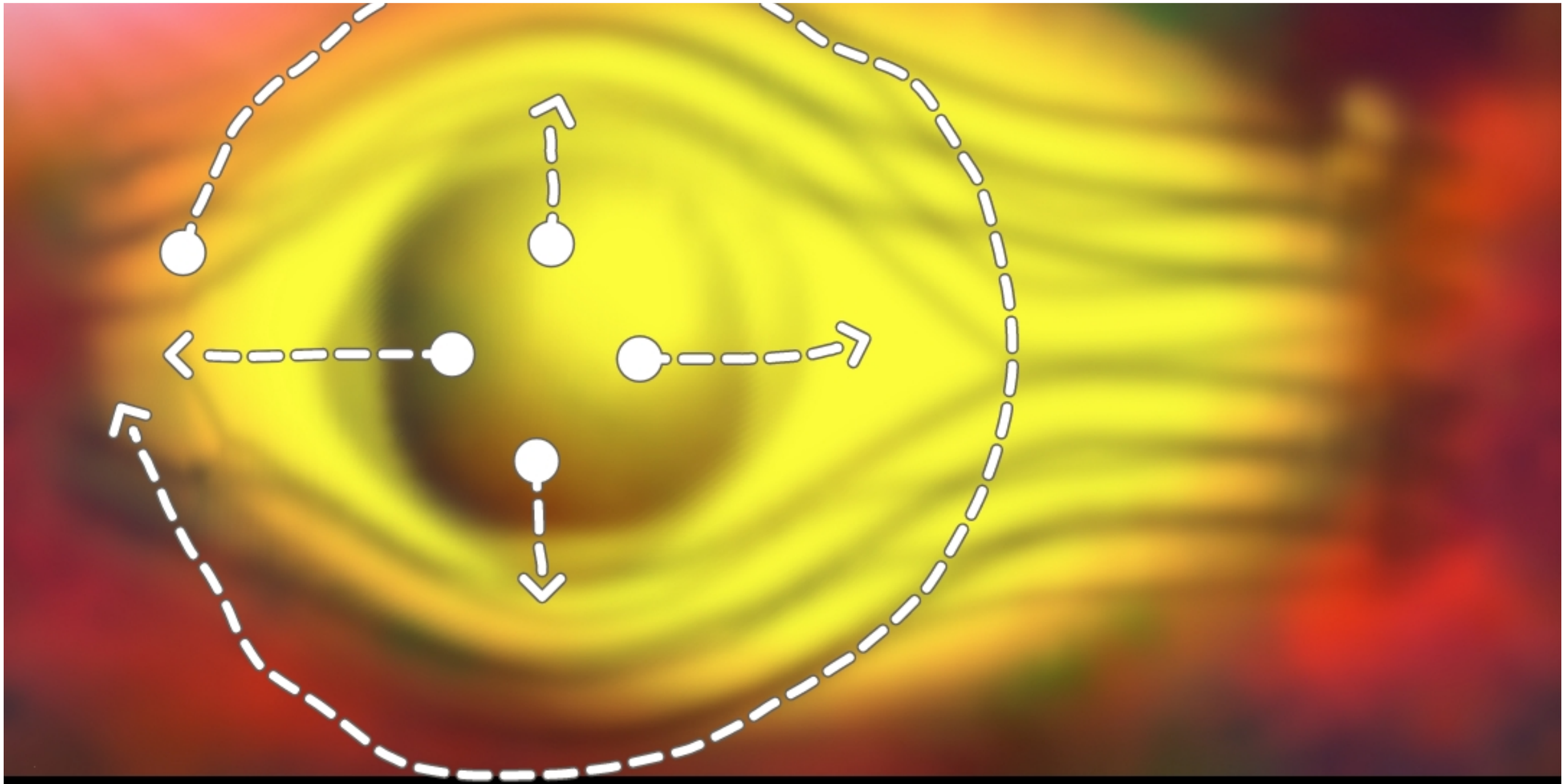
2. In the south region, there are four animated paths.

3. The regions are interleaved with a circular not joint arrow.

4. The four animated paths are pointing in a cardinal fashion (north, south, east and west) and centred in the circular animated path.



Caption



7.2 This video output is showing a streamline of hot flare around an earth core in yellow colour and red hot flare.

Caption

8: Animated Path

Electrostatic Field

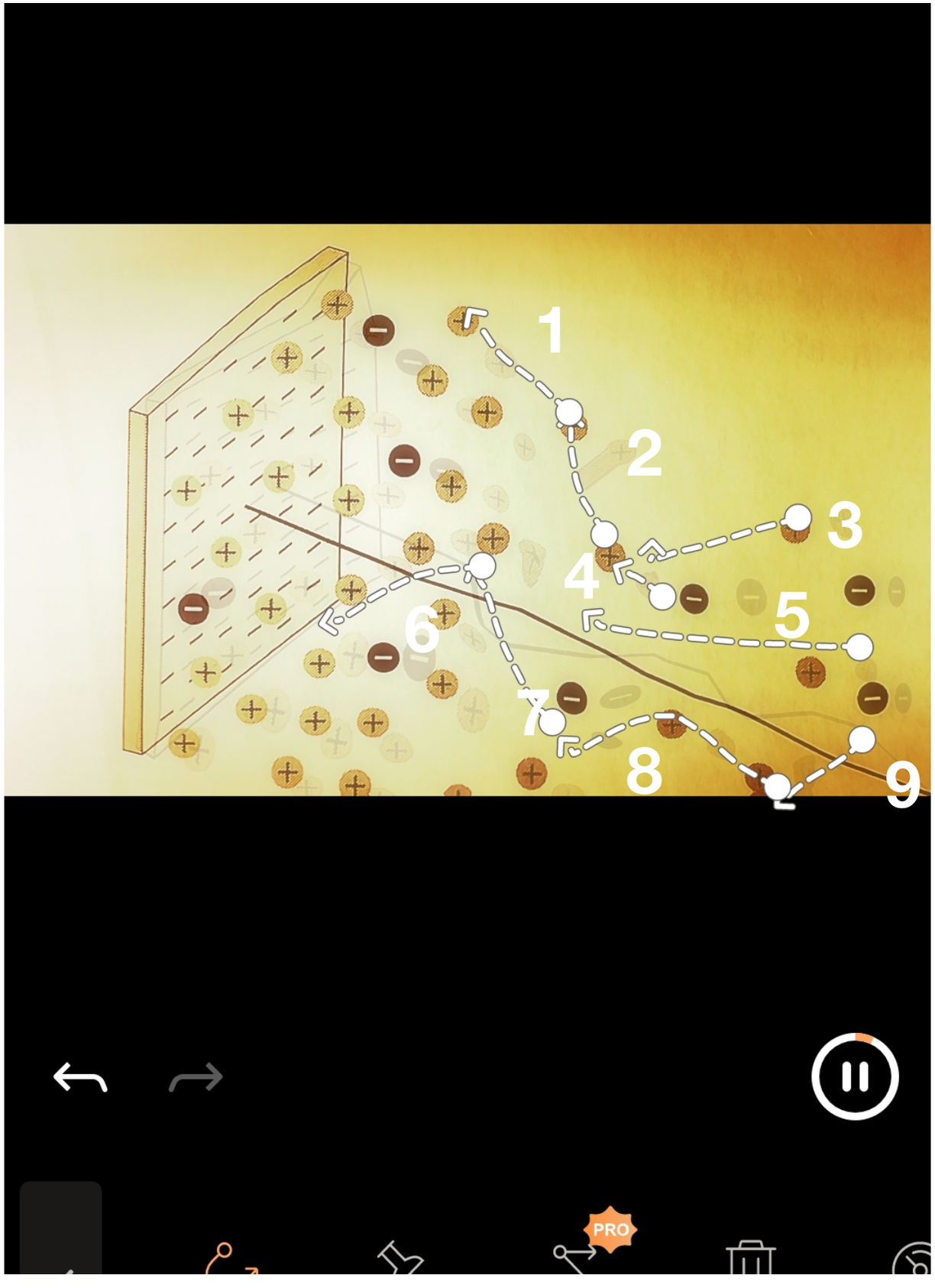
The animation path name is electrostatic field.

This is showing charges both positive and negative ions emitting from a material plate. A concept of physics.

There are nine animated paths in this scene only.

The length for dash lines:

Path 1:4, Path 2:3, Path 3:5, Path 4: 1, Path 5:10, Path 6:5, Path 7:6, Path 8:8 and Path 9:3.



Caption

8.1: Animated Region

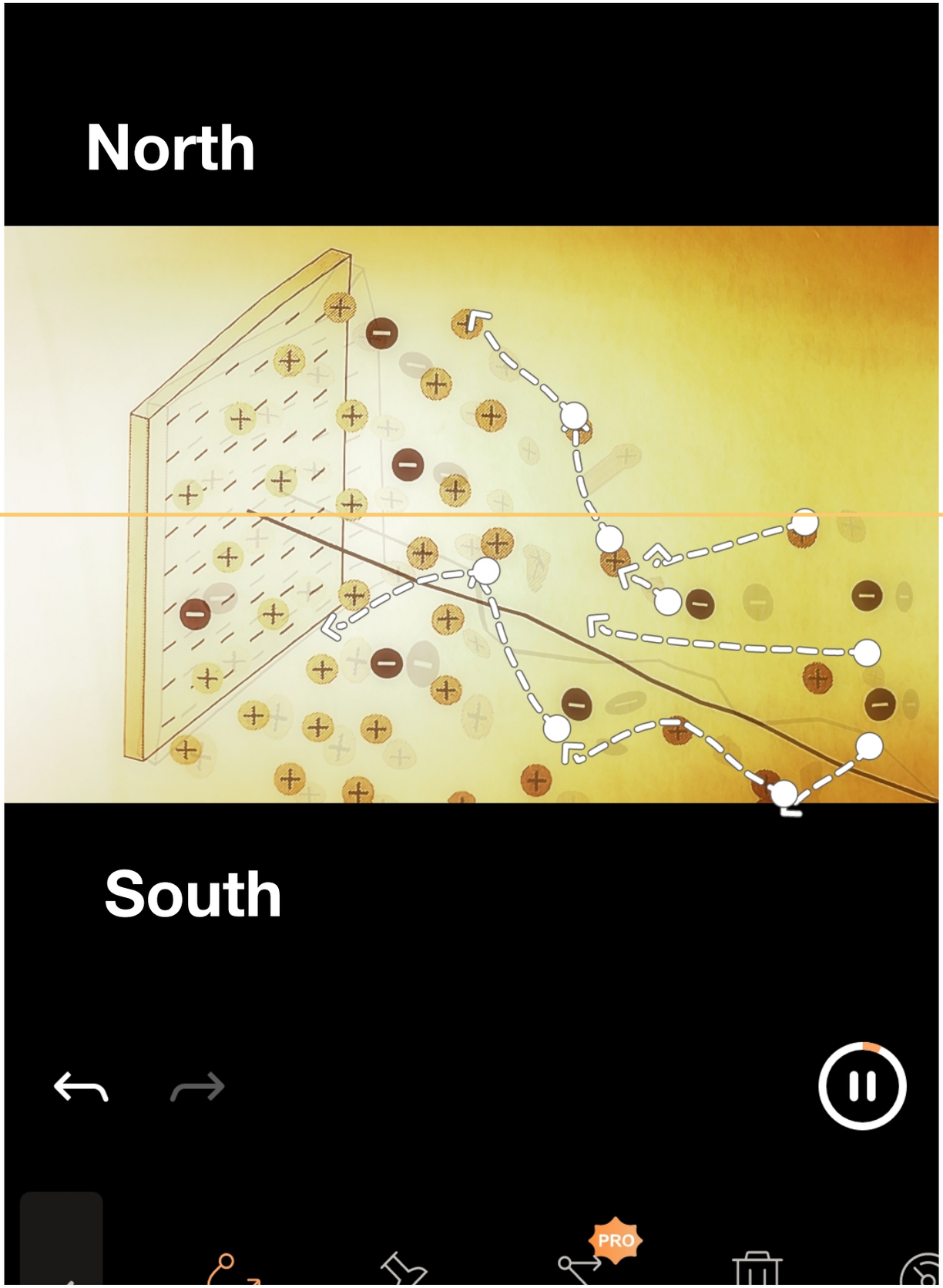
Cardinal and Coordinates

1. In north region, animated paths numbered as 1 and 2 are there.

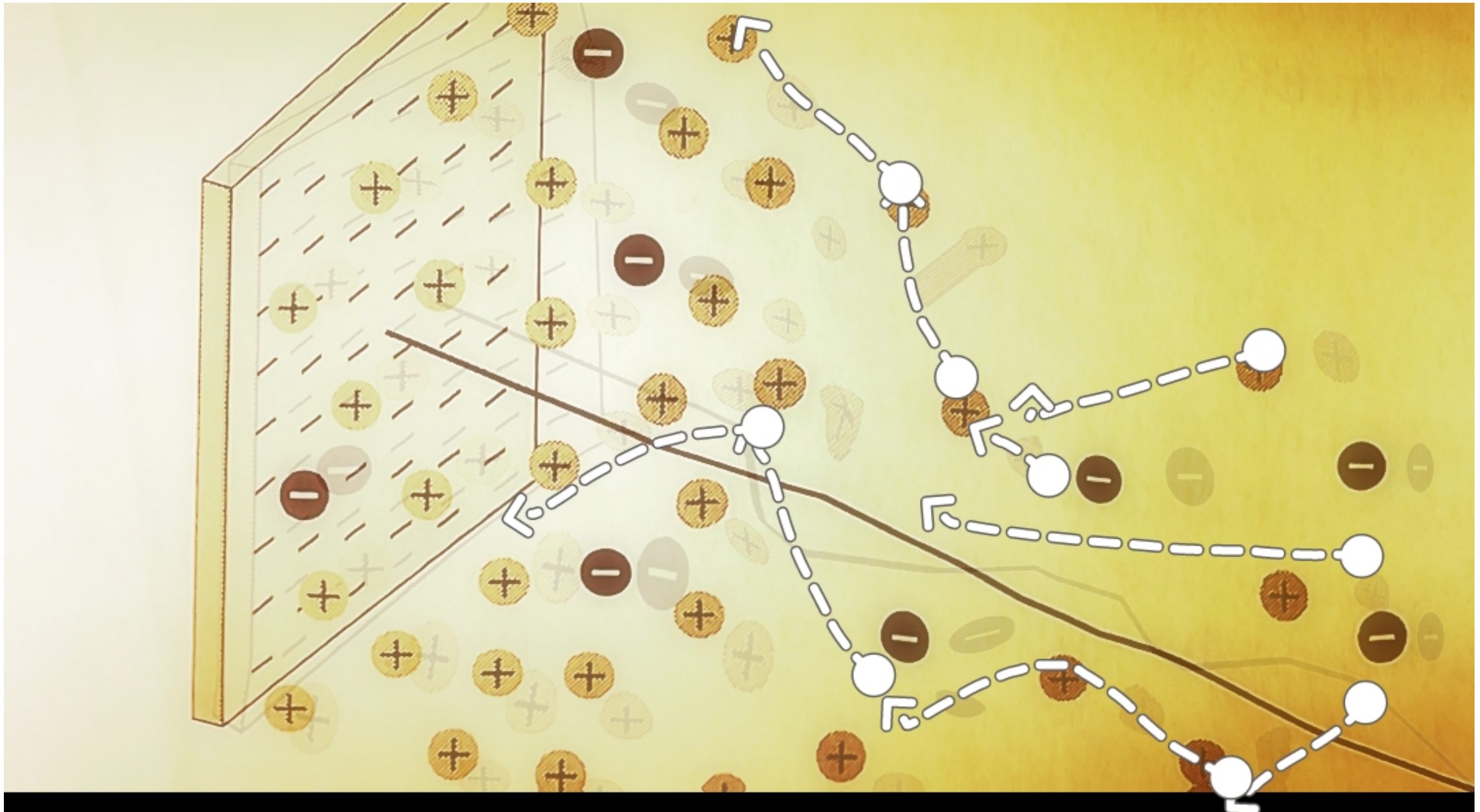
2. In south region, animated paths numbered as 3, 4, 5, 6, 7, 8 and 9 are there.

3. There are four upward animated arrows.

4. Two zig-zag animated paths (9,8,7,6) which are flowing after the other.



Electrostatic Field



8.2 This output is a video showing a field emitting charge ions from a material plate on applied electricity.

Caption

9: Animated Path

Colour Balls Duck

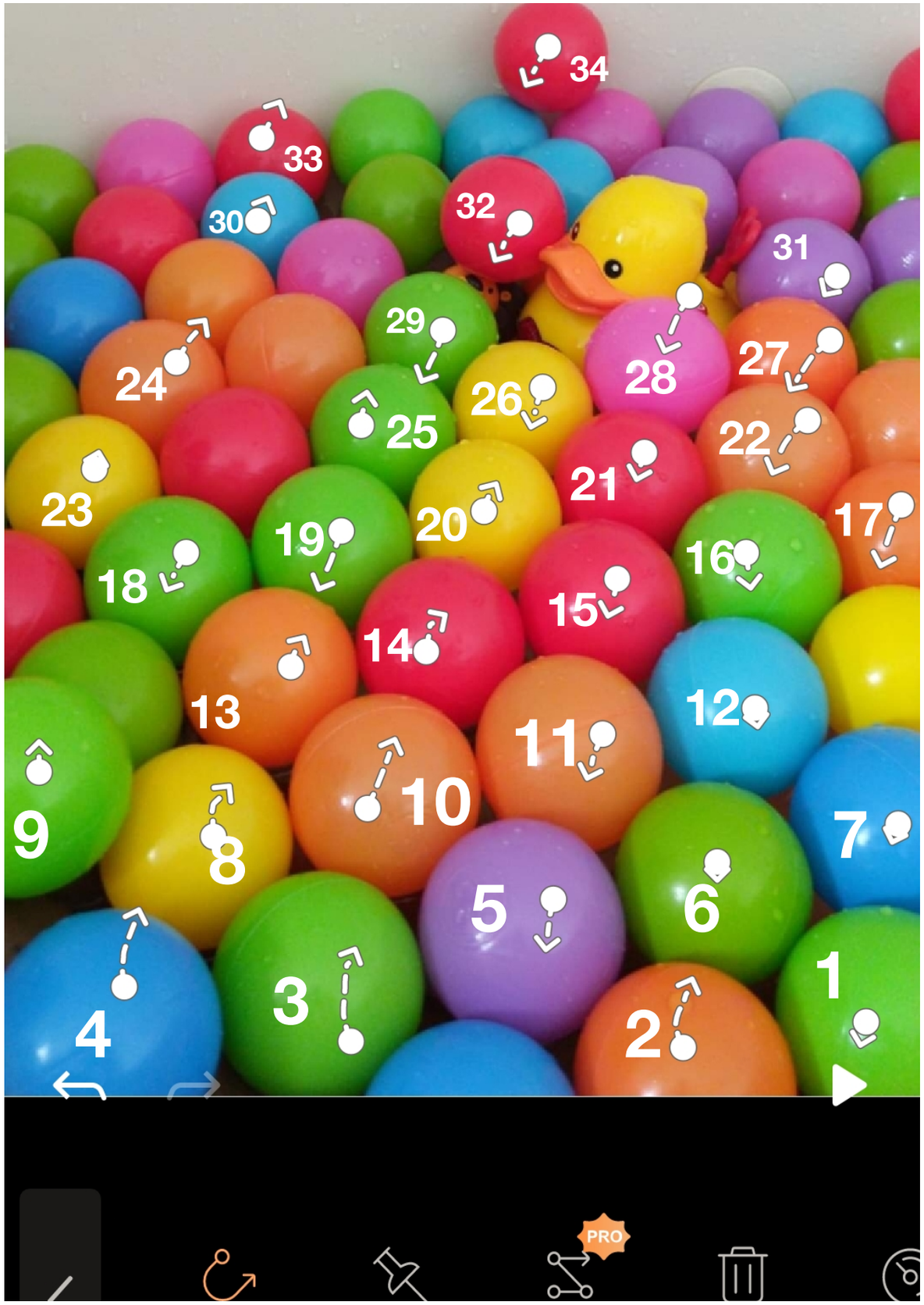
The animated path name is a colour balls duck.

This scene is showing balls of about 6 colours namely red, pink, yellow, blue, green, orange and violet. A duck toy is in the picture.

There are about 34 animation paths in the scene only.

The length of dash lines:

Path 1:0, Path 2:2, Path 3:3, Path 4:2, Path 5:1, Path 6:0, Path 7:0, Path 8:1, Path 9:0…. Path 27:2, Path 28:1, Path 34: 1.



Caption

9.1: Animated Region

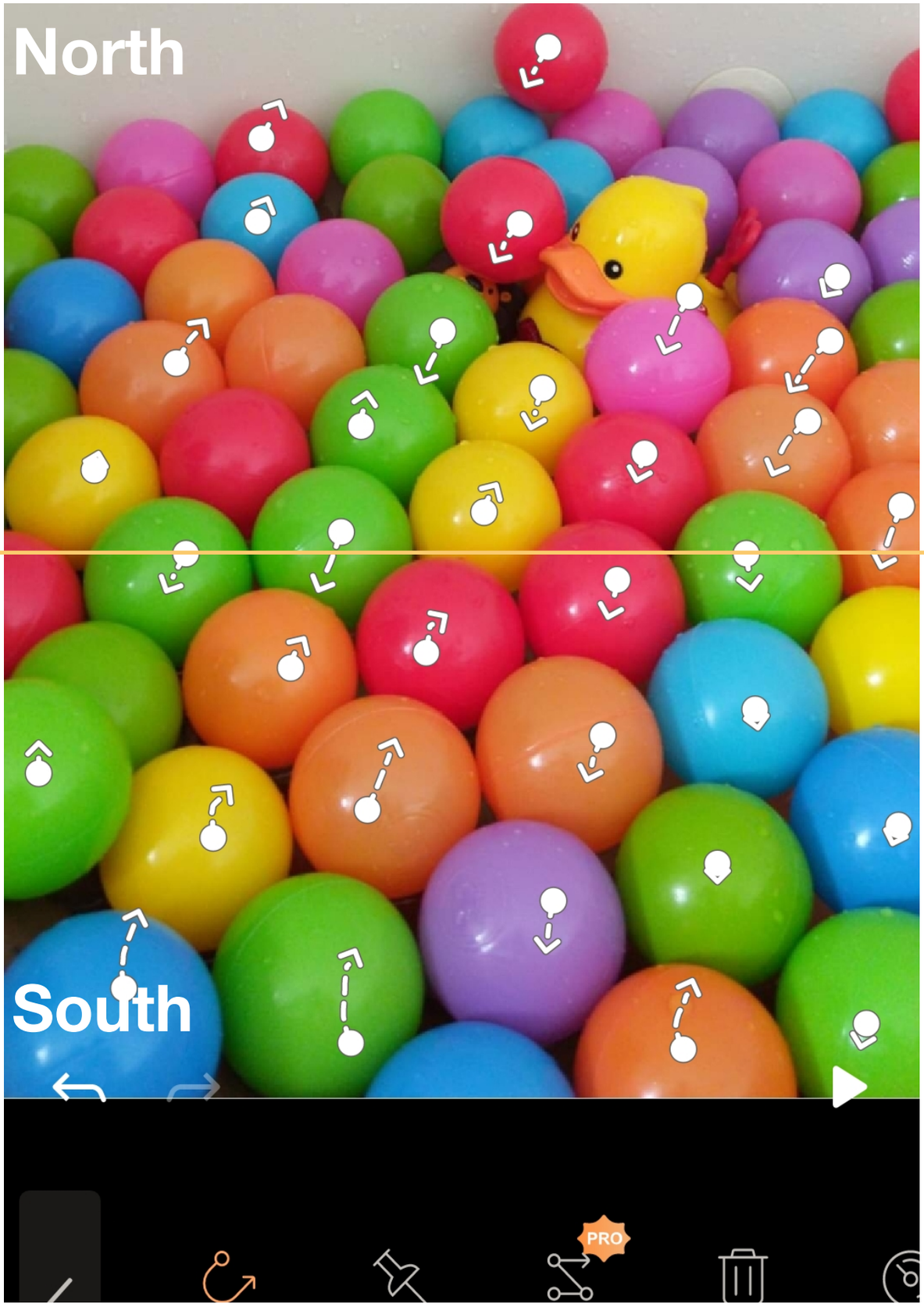
Cardinal and Coordinates

1. In the south region, there are 16 balls in there.

2. In the north region, there are about 18 balls in there.

3. There are about 21 balls in the south region.

4. There are about 45 balls in the north region.



Caption

9.2 This video is about coloured balls animation film made from 34 animated paths.

Chapter 3. Concept of Animation.

On understanding the intermedia animation with image-loop method using transition indexing approach. Image-Looping on photo-image, graphics object or graph figure creates a motion picture of still images with delayed seconds in between each frame. [12]

Animation[18] is the graphic art which occurs in time. Whereas a static image (such as a Picasso or a complex graph) may convey complex information through a single picture, animation conveys equivalently complex information through a sequence of images seen in time. It is characteristic of this medium, as opposed to static imagery, that the actual graphical information at any given instant is relatively slight. The source of information for the viewer of animation is implicit in picture change: change in relative position, shape, and dynamics. Therefore, a computer is ideally suited to making animation" possible" through the fluid refinement off these changes.

"*The Fundamentals of Animation by Paul Wells[13] offers an illustrated and visually stimulating* introduction to the key elements of animation. It discusses the key principles and processes involved in animation, exploring the entirety of the creative process from finding and researching a concept, through the preparation and techniques used, to the execution of the work. Each stage is presented in an engaging visual style, accompanied by examples and analysis of contemporary student and commercial animation. The book also discusses the links between animation and the styles and narratives of other areas of popular culture, aligning theory and ideas to practical advice. It includes a section for aspiring animators examining career paths, portfolios and the structure of the creative industries.

Proceedings of the 11th annual conference on Computer graphics and interactive techniques, 177-186, 1984 [14]

———————

A software environment is described which provides facilities at a variety of levels for “animating” algorithms: exposing properties of programs by displaying multiple dynamic views of the program and associated data structures. The system is operational on a network of graphics-based, personal workstations and has been used successfully in several applications for teaching and research in computer science and mathematics. In this paper, we outline the conceptual framework that we have developed for animating algorithms, describe the system that we have implemented, and give several examples drawn from the host of algorithms that we have animated.

Image-Loop (Figure 1) is the cause of an intermedia animation by a controller and effect motion of pictures on display. Image controller is a simple control statement made by a *for-loop* or *while-loop*. Animation is a way of representing a sequence of intermedia objects like image, infographics and graphs(Figure 2) to create excitement or energy. It consists of series of drawings that look as if they are moving. The sequence of indexes of images create series of frame animation display. A frame just like a picture frame is hold in a container of some decoration. Frame count is the number of frames in a sequence. It is the size of indexes. A transition index has a sequence of indexes of images. Transition can be used to apply position for one or more sequence of intermedia objects. With transition indexing, it is possible to serial animate. This is done in order to create a motion of auto-update image display. Simply, to make a movie of an image-world. Let's keep our hands clean.

Animation is a vital resource for researchers and developers of cloth simulation software as well as computer animators and graphics programmers. Animation as an aid to multimedia learning.

————————————[4]

Richard E Mayer, Roxana Moreno Educational psychology review 14 (1), 87-99, 2002

———————————-

How can animation be used to promote learner understanding of scientific and mathematical explanations? In this review, they examine the role of animation in multimedia learning (including multimedia instructional messages and micro-world games), present a cognitive theory of multimedia learning, and summarise their program of research, which has yielded seven principles for the use of animation in multimedia instruction. These include the multimedia principle (present animation and narration rather than narration alone), spatial contiguity principle (present on-screen text near rather than far from corresponding animation), temporal contiguity principle (present corresponding animation and narration simultaneously rather than successively), coherence principle (exclude extraneous words, sounds, and video), modality principle (present animation and narration rather than animation and on-screen text), redundancy principle (present animation and narration rather than animation, narration, and on-screen text), and personalisation principle (present words in conversational

rather than formal style). Animation can promote learner understanding when used in ways that are consistent with the cognitive theory of multimedia learning.

——————————[17]

Oliver Ehmer Imagination und Animation, 2011

——————————

Imagination in conversations: This book explores a mental phenomenon from a conversation analytic perspective. It analyses sequences from interactions in which the speakers assume the roles of characters, animate what they say and put themselves in an imagined scene. Imagination is understood as conversational activity and mental phenomenon to establish a shared cognition. The study provides an important contribution to the topic of imagination and impressively combines the research fields of interactional linguistics and cognitive semantics.

This paper[19] introduces spatial key framing, a technique for performance-driven character animation. In traditional temporal key framing, key poses are defined at specific points in time: ie, we define a map from a set of key times to the configuration space of the character and then extend this map to the entire timeline by interpolation. By contrast, in spatial key framing key poses are defined at specific key positions in a 3D space where the character lives; the mapping from the 3D space to the configuration space is again defined by interpolation. The user controls a character by adjusting the position of a control cursor in the 3D space; the pose of the character is given as a blend of nearby key poses. The user thus can make expressive motion in real time and the resulting motion can be recorded and interpreted as an animation sequence. Although similar ideas are present in previous systems, our system is unique in that the designer can quickly design a new set of keyframes from scratch, and make an animation without motion capture data or special input devices. Our technique is especially useful for imaginary characters other than human figures because we do not rely on motion-capture data. We also introduce several applications of the basic idea and give examples showing the expressiveness of the approach.

[21] introduces digital animation as an arts-based research medium by laying a theoretical foundation for its use and describing how it can become a participatory methodology.

The authors link research through digital animation to performance, ethno-drama, film, photography, and visual arts traditions leading to a rationale for using animation as a qualitative research tool. A vignette of an ongoing ethnography contextualises animation as a process and as a product. In this chapter, the authors argue that digital animation (1) facilitates the use of metaphorical imagery to vividly and emotively capture lived experiences and (2) invites a unique audience into the research discourse. An algorithm animation (AA) visualises the behaviour of an algorithm by producing an abstraction of both the data and the operations of the algorithm. Initially it maps the current state of the algorithm into an image, which then is animated based on the operations between two succeeding states in the algorithm execution. Animating an algorithm allows for better understanding of the inner workings of the algorithm, furthermore it makes apparent its deficiencies and advantages thus allowing for further optimisation.

Imagine having thousands of images captured by a camera and want to artificially create an animation either in .gif format or .mpeg format. Gif[13,14] stands for graphics interchange format whilst .mpeg also represents moving picture experts group[11,12]. Animation is the noun for motion pictures in delay time, T[15] expressed as frame per second. A frame per second is the frame rate for inanimate. For a thousand images with t delay in seconds, it will take approximately

T = t x 1000 seconds.

3.1 Transition Indexing on Image-Loops Method

An organisational view like a stack of pictures will operate like display and pop. This organisation will increase the delay time by a deletion time.

For thousand of images, it take in seconds approximately:

*T=(t + t1) *1000, where t is delay for display and t1 for pop*

.

Again an advantage will be memory reduction in file size (fize) . Every time an image displays, afterwards it gets removed from a stack to a poplist. An organisational view like a list of pictures will operate as display and increment indexing. This organisation will not increase the delay time because it can access on an index position.

Increment indexing is normally a plus plus - index plus one increasing. Increase Indexing by one can be changed to numeric variants like even indexing, odd indexing or prime indexing. Even indexing will be indexes on even numbers - a plus two indexes. An organisational view of LIFO (last-in first out) will operate like a reverse of pictures in file. These organisations of virtual goods to simply create a delay enough to cater for rendering time. An exponential delay of rendering time is added to the overall delay.

T=(t + t1(e(x) +1)) *1000, where t is delay for raster display and t1 for accessing file.*

Previous work used the letters except transind, transition and seq. This article is mainly focus on using these letters as it may be. Lets look at some pseudocode on the several transition scenarios :

Let img[incfm] be a container utility for all images. Let incfm be the index of image.
Let fmcnt be the total desired number of images.
Let display be the show function.

Let frame be the image to display.
Let transind be a transition index.
Let transition[transind, seq] be a map container utility for all transitions.
Let seq be the sequence of indexes mapped to transition index.

3.2 Default List Image-Loop Pseudocode.

Let lst be the list utility

Listing 1: Image For-Loop::

```
1: loadfromFile(img); 2: initialize(incfm=0);

for(incfm;incfm<fmcnt;incfm++) {
3: lst.add(img[incfm]);
4: frame=lst.get(incfm);

5: display(frame) ;
}
```

Listing 2: Image While-Loop::

```
1: loadfromFile(img);
2: initialize(incfm=0); while(incfm<fmcnt)
{
3: lst.add(img[incfm]); 4: frame=stk.get(incfm); 5: display(frame) ;
6: incfm++;
}
```

3.3 Sequence Animation Pseudocode with Fixed Transition Indexing, transind=1 or any

Let lst be the list utility ***Listing 3: Image For-Loop***::

```
1: loadfromFile(img);
2: initialize(incfm=0, transind=1 | any, seq=transition(transind) );

for(incfm;incfm<seq.size();incfm++) {
3: lst.add(img[seq[incfm]);
4: frame=lst.get(lst.lastindex()); 5: display(frame) ;
}
```

Listing 4: Image While-Loop::

```
1: loadfromFile(img);
2: initialize(incfm=0, transind=1 | any, seq=transition(transind) );
while(incfm<seq.size())
{
3: lst.add(img[seq[incfm]]);
4: frame=stk.get(lst.lastindex() );
5: display(frame) ;
6: incfm++;
}
```

3.4 Transition Indexing Pseudocode

Let lst be the list utility

Listing 5: Image For-Loop::

```
1: loadfromFile(img);
2: initialize(incfm=0, seq=transition[transind] , transind=0); for(transind;
transind<transition.size(); transind++)
{
3: seq=transition[transind]; for(incfm;incfm<fmcnt;incfm++)
{
4: lst.add(img[seq[incfm] ]);
5: frame=lst.get(lst.lastindex());

6: display(frame) ; }
```

Image While-Loop::

```
1: loadfromFile(img);
2: initialize(incfm=0, seq=transition[transind] , transind=0);
while(transind<transition.size())
{
3: seq=transition[transind]; while(incfm<fmcnt)
{
4: lst.add(img[seq[incfm] ]);
4: frame=stk.get(lst.lastindex());
5: display(frame) ;
6: incfm++;
}
7: transind++;
}
```

The transition on even indexing and odd indexing in terms of pseudocode are now written. The variant indexing is similar except sequence indexing is made on even numbers or odd numbers or even prime numbers.

3.4.1 Using Transition Indexing with Even-Indexing List Image-Loop Pseudocode.

Let lst be the list utility

Image For-Loop::

```
1: loadfromFile(img);
2: initialize(incfm=0, seq=transition[transind] , transind=0); for(transind;
transind<transition.size(); transind++)
{
3: seq=transition[transind]; for(incfm;incfm<fmcnt;incfm+=2)
{
4: lst.add(img[seq[incfm] ]);
5: frame=lst.get(lst.lastindex());
6: display(frame) ;
}
}
```

Image While-Loop::

```
1: loadfromFile(img);
2: initialize(incfm=0, seq=transition[transind] , transind=0);
while(transind<transition.size())



{
3: seq=transition[transind]; while(incfm<fmcnt)
{
4: lst.add(img[seq[incfm]]);
5: frame=stk.get(lst.lastindex()); 6: display(frame) ;
7: incfm+=2;
}
8: transind++;
}
```

3.4.2 Odd-Indexing List Image-Loop Pseudocode.

Let lst be the list utility Let odd be a list utility

Listing 6: Image For-Loop::

```
1: loadfromFile(img);
2: initialize(incfm=0, seq=transition[transind] , transind=0); for(transind;
transind<transition.size(); transind++)
{
3: seq=transition[transind]; for(incfm;incfm<seq.size();incfm++)
{
4: lst.add(img[seq[incfm]]);
5: frame=lst.get(lst.lastindex());
6: display(frame) ;
}
}
```

Listing 7: Image While-Loop::

```
1: loadfromFile(img);
2: initialize(incfm=0, seq=transition[transind] , transind=0); while(transind
<transition.size())
{
3: seq=transition[transind]; while(incfm<seq.size())
{
4: lst.add(img[odd[incfm]]);
5: frame=lst.get(lst.lastindex());
6: display(frame) ;
7: incfm++;
}
8: transind++;
}
```

4 Figures and Appendices

4.1 Figure

Figure 1

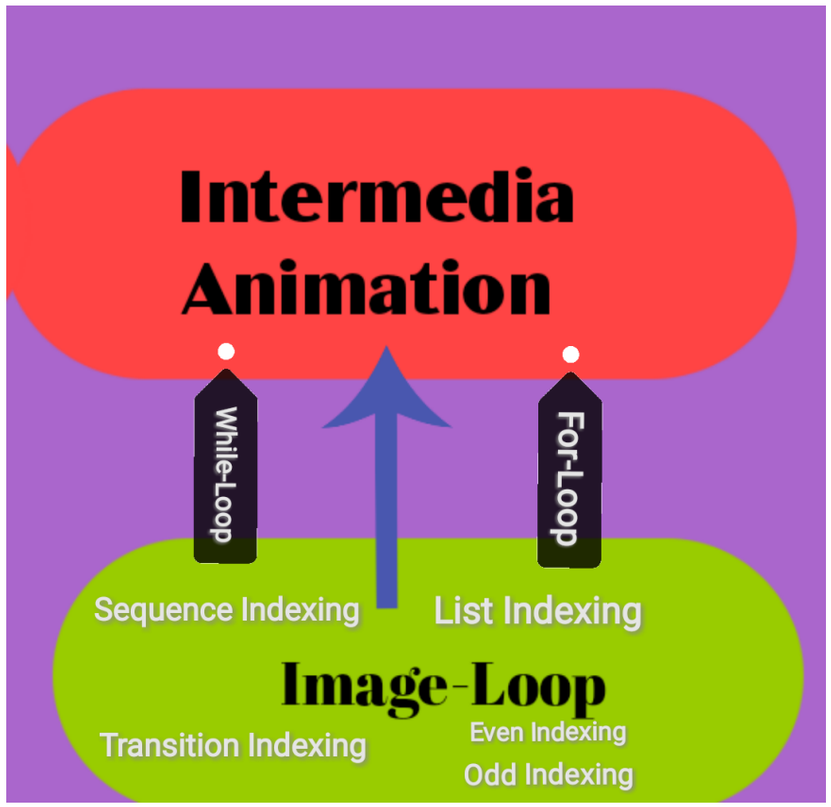
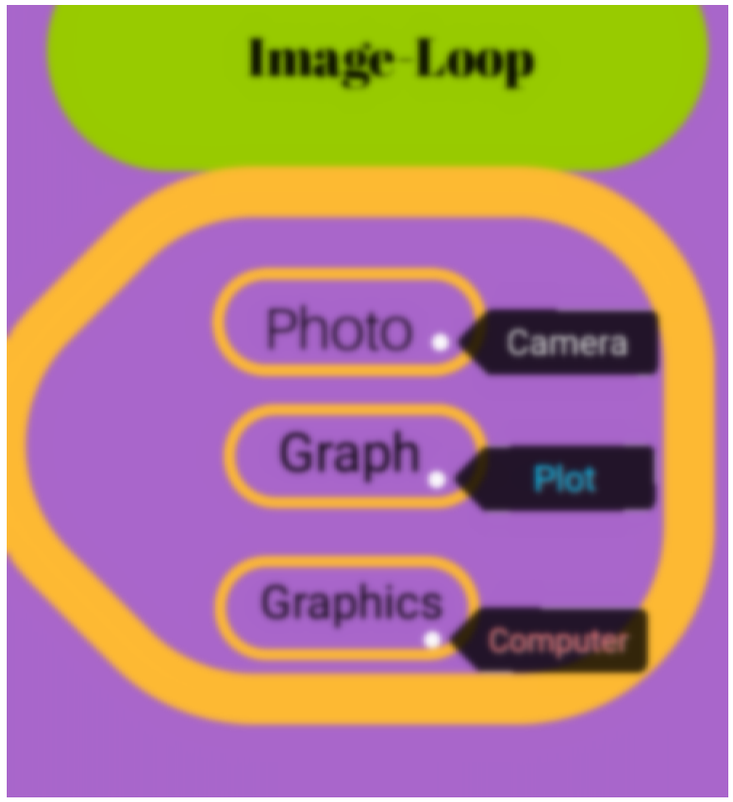


Figure 2



4.2 Appendices

Listing 1: Image For-loop on Default List Pseudocode

Listing 2: Image While-loop on Default List Pseudocode

Listing 3: Image For-loop on Sequence Animation Pseudocode

Listing 4: Image While-loop on Sequence Animation Pseudocode

Listing 5: Image For-loop on Transition Indexing Pseudocode

Listing 6: Image For-loop on Odd Indexing Transition Indexing Pseudocode

Listing 7: Image While-loop on Odd Indexing Transition Indexing Pseudocode

Summary

This work is about transition indexing and this describe sequences of animation with different framing. The transition indexing is a map of incremental index key and a sequence of image indexes. The incremental index key returns a sequence of image indexes. The image Loop is now a double process and can be termed Image Double Loop on Transitive Mapping.

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2. Image 1: Tom and Jerry (2017). Image Capture on Tv series.

3. Image 2: Tom and Jerry (2017). Image Capture on Tv series.

4. Image 3: Viral body. Web image objects.

5. Image 4: Ant swarm body. Video image recorded at home.

6. Image 5: Cylindrical volume and Tablets. Image capture from Physical Biology of the Cell by Rob Philips, Jane Kondev and Julie Theriot. Garland Science.

7. Image 6: Triple Clocked Feet. Image capture from Physical Biology of the Cell by Rob Philips, Jane Kondev and Julie Theriot. Garland Science.

8. Image 7: Superheat Core. Image Capture (2018). Physic Book.

9. Image 8: Electrostatic Fields. Image Capture (2018). Physic Book.

10. Image 9: Colour Balls Duck. Web Image Capture from Friends Facebook Page.

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